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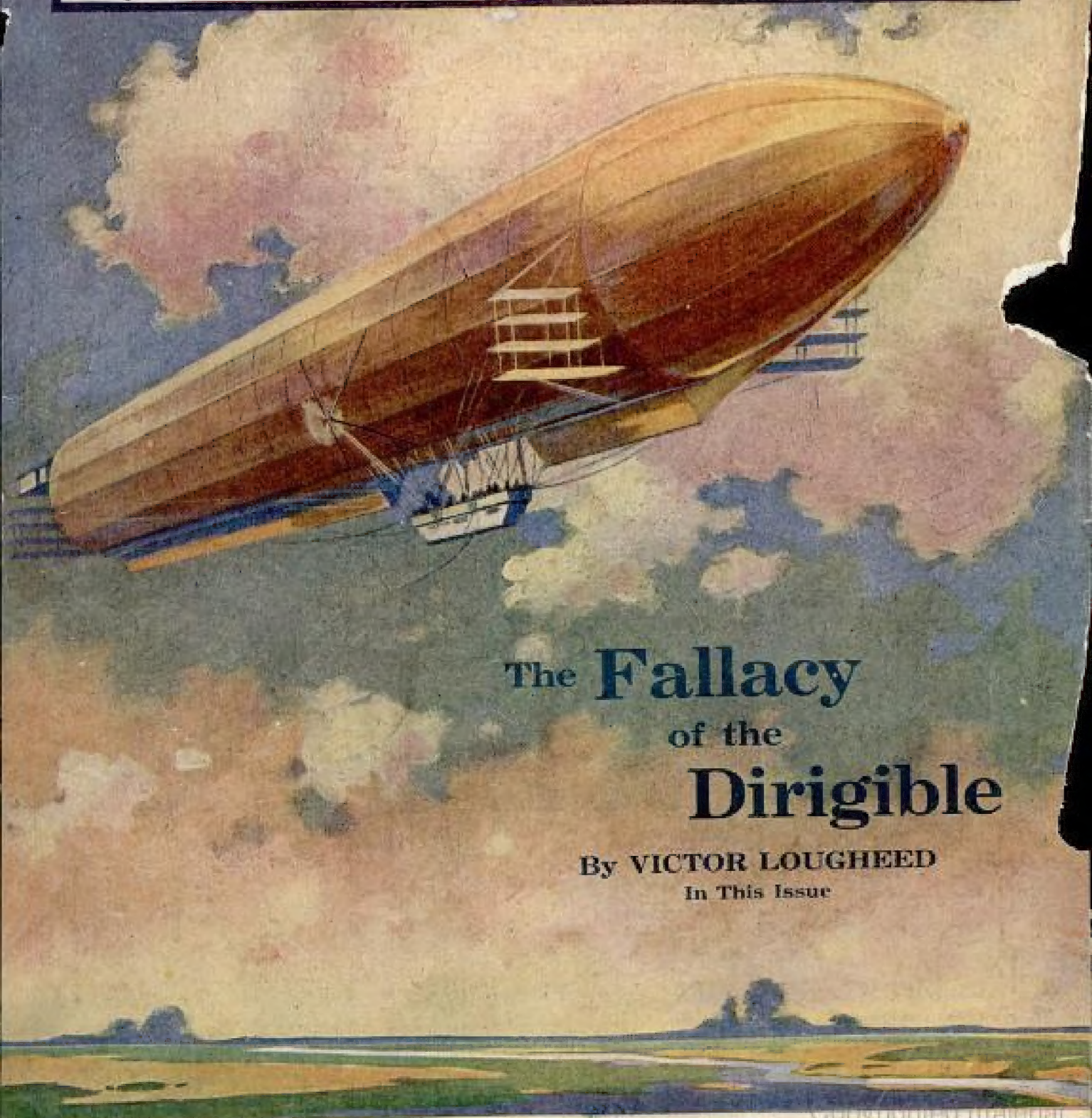

The Fallacy of the Dirigible

By VICTOR LOUGHEED

In This Issue

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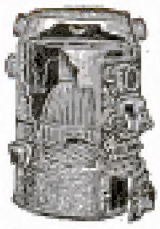

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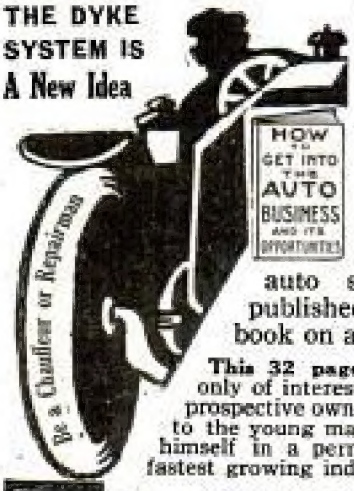

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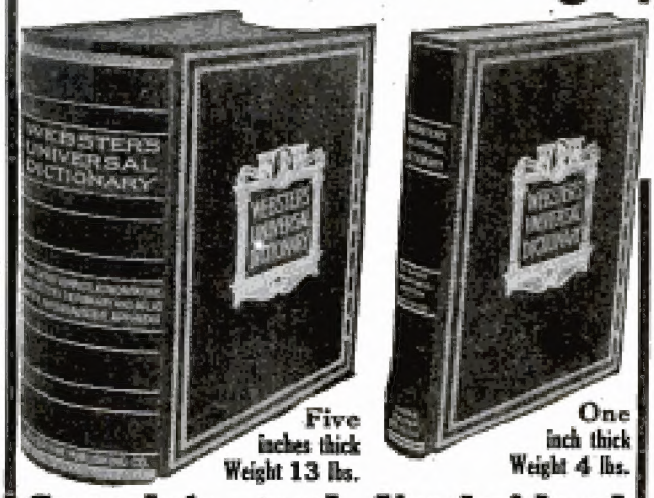

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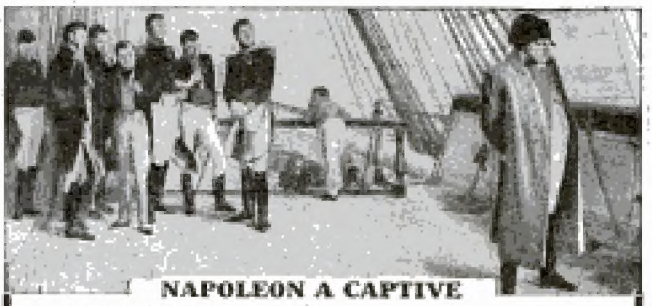

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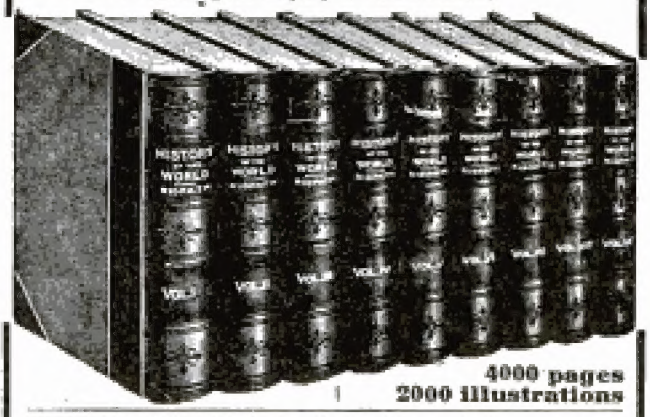

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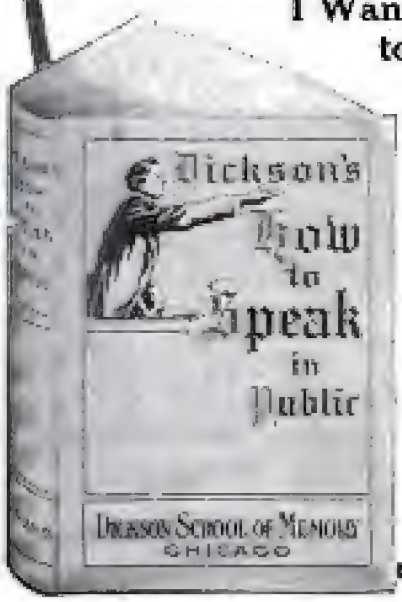

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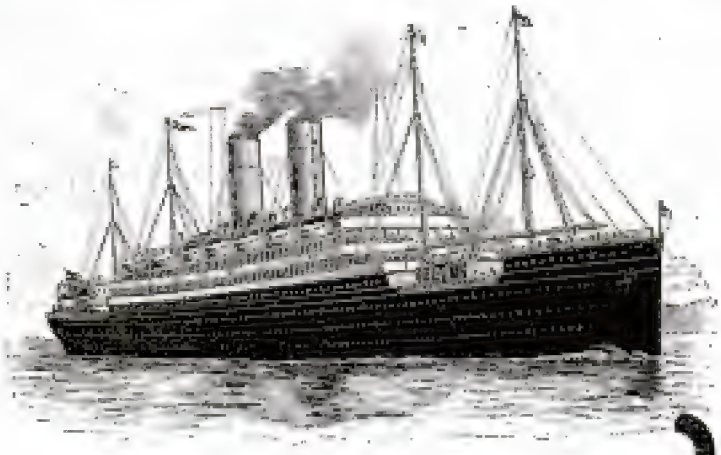

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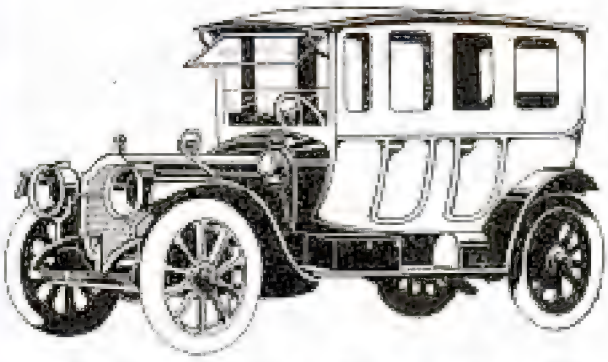

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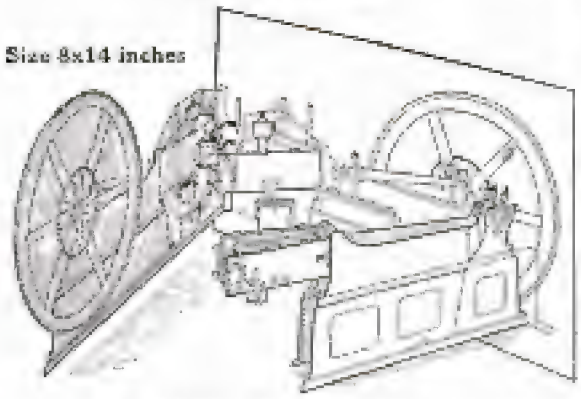

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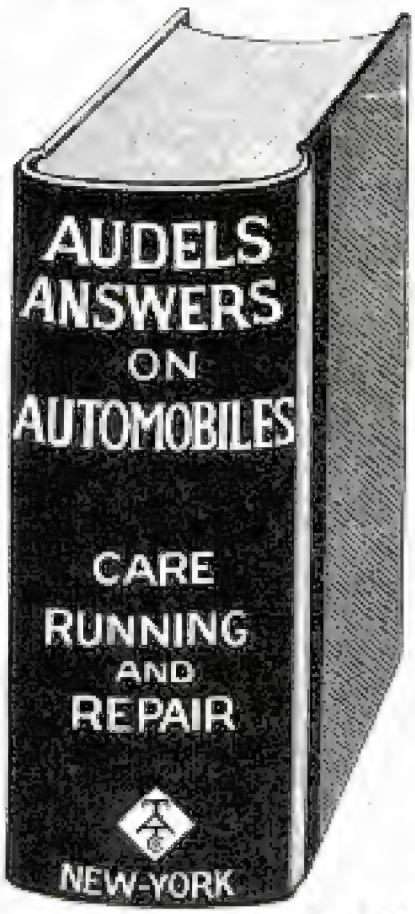

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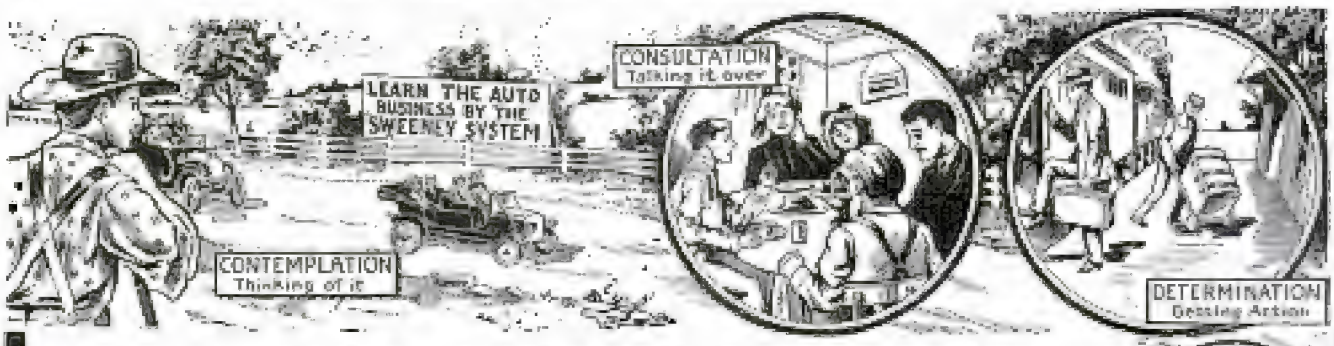

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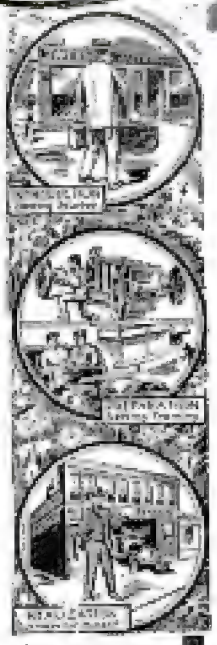

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AGENTS WANTED

GET THIS OFFER—All the clothes you want. All the money you want. To learn how you can have one of our stunning swell tailored suits absolutely free, not a penny of cost to you (we prepay the express); to learn how you can make $5.00 to $10.00 a day, every day of your life, to find out what beautiful tailoring really is, to offer styles that everybody goes wild about, to get all of your own clothes always free, do this today, now, this minute, write us a letter or postal and say, "Send me your New Wonderful Tailoring Offer," and receive by return mail, free, the most astonishing tailoring offer you ever heard of, a beautiful set of samples to pick from, styles that will get your county afire, an offer so surprising, so new, so liberal, so wonderful, you can hardly believe it. A. J. Folk, Tenn., writes: "I never had a suit as swell. Made $110.00 last month, besides my own suit." Ed Hill, Miss., says: "The men are wild about your styles. No trouble getting orders. My profits $40.00 last week and all the tailoring I want." R. P. Gatewood, Pa., says: "My suit cost me nothing. Nice, easy business. Thanks for $28 check." You don't need money or experience. No matter what you are doing, selling books, cutlery, groceries, soap, tailoring for others, or just working, be sure to get our offer, it's so much better than anything else. We want good agents everywhere. Your spare time only will do. Write at once and receive line outfit and samples free. Everything explained. The greatest offer ever heard of. You will succeed sure, make big money and wear fine clothes. Write now or show this to a friend who may be glad of this great chance. Address Banner Tailoring Co., Dept. 448, Chicago.

BIG PROFIT IN FIBERSILK KNITTED TIES. Made by new process on patented machines in many rich, beautiful colors. Brilliant, silky lustre—washable. Sell quickly at 35 and 50 cents each—can sell for 25 cents and still net you 100 per cent profit. Exceptional proposition for spare time and agents. Send 15c for sample tie (guaranteed). Neat sample display box to agents. Fisher Knitting Co., 40 Whitesboro St., Utica, N. Y.

AGENTS! Wild with excitement! Do you blame them? Everybody eager to buy our beautiful artistic air brush design show cards. Cards printed in colors, 11x14, 340 varieties. No talking—simply show the show cards to storekeepers—the cards speak for themselves. Big profits, something new. Tide just setting in. Can start mail order business. Beautiful two-color catalog furnished with your imprint. The show cards are great, you'll say so, you can't help it. Wake right up, no time to argue. Do it now, send this very minute a letter or postal for free catalog and sample, also the "Money Maker." Popular Show Card Co., Desk W, 1255 Michigan Ave., Chicago.

BIG MONEY to agents selling O-tak-a Tire Remover. The only tire remover in the market that will do what is advertised. Sells for $5.00. 50% profit to the agent. Many people ordering two and three at a time by mail. One sale makes four or five new customers. Write for proposition for exclusive territory. J. W. Grumiaux, sales agent, Le Roy, N. Y.

BIG MONEY IN SELLING USED AUTOMOBILES—No business so easy to learn, so profitable, so congenial. On $50 to $200 investment our Agents make $50 to $100 per week. We furnish the cars and teach you how to drive, sell and repair them. Write today for particulars and territory. The Automobile and Cycle Company of America, Dept. One, 1769-1787 Broadway, New York City.

AGENTS—To sell the newest electric appliance on the market; sold everywhere there is electricity, in the home and office; liberal profit; sales-driving sample, weighs a pound, no experience or knowledge of electricity required; it shows how to use one light instead of two and get the same results; sells for $2.50 and saves the purchaser an investment of $25; write for particulars. The Handy Light Co., 711 East Eighth Avenue, Cincinnati, Ohio.

HAVE YOU MONEY TO MAKE MONEY? We want hustling agents and general agents, with from $5 to $50 capital. We give exclusive city or State agency and send samples to every telephone user. Just call and sale is made. Four cents, stamps, brings sample and particulars. Positively no postals answered. Bellim P. Mfg. Co., 247 W. 125th St., New York.

ATTENTION—One pint of milk merged into one pound of butter, 4 cents pound. Looks the same, used the same, gets as hard and is sweet as fresh country butter. No chemicals used. Godsend to every family. Wonderful machine. Family size, $3. 100 per cent profit. County and State agents wanted on salary and commission. 30 sworn testimonials from home users of this great money saver. Illustrated circulars and agents' credit terms sent free. Family Butter Merger Co., Indianapolis, Ind.

SALESMEN—Send your name and address to Raymond E. Wood, 890 East Eighth St., Cincinnati, Ohio. I am the manufacturer's Sales Manager for the best household and office electric specialty ever invented. Sells for $1.00 and $2.50. Guarantee for credit or deposit required. Capable men only need apply. I want only a few men; the work is permanent, profitable and high-grade. You will be given territory and expected to produce business.

AGENTS, BOTH SEXES: LIFETIME OPPORTUNITY—Our high-grade household specialties positively breaking all records; whirlwind sellers, repeat orders every house, no competition, immense profits—Immediate replies will secure Free beautiful catalog and extraordinary proposition. Atlantic Supply Co., Montclair Ave., Montclair, N. J.

AT LAST THE BEST SELLER for agents has been found; we have it, a deaf and dumb agent could sell it; don't take our word for it; send for particulars that will prove it. The Big-Starry Supply Co., Dept. 16, Brigham City, Utah.

MAKE $20.00 daily with our Diamond machine, takes pictures without negatives. Postals, buttons, all sizes, in one minute. Anybody can operate. Price $7.50 up. Write for free circular. International Metal & Ferrotype Co., Dept. A. C., Chicago, Ill.

AGENTS, MEN OR WOMEN, make big money handling Grab's Famous Household Specialties. Fastest selling articles of the age. Easy, fascinating work. Spare time or permanent. Hurry. Write today. Victor M. Grab & Co., C16 Ashland Block, Chicago, Ill.

NEW SUIT OFFER! Just send us your name and you will promptly receive the most astonishing—yes, wonderful suit offer, together with Paragon Complete Outfit, packed with big assortment of Cloth Samples, Tape Measure, Fashion Figures, Order Blanks, etc.—all absolutely Free by Return Mail. Postpaid. This includes an offer on a fine suit for yourself so liberal it will startle you, and our Grand Offer to start you in a big money-making business for yourself. Our wide-open terms, conditions and privileges will astonish you. The low prices we will make you on men's high-class clothes will amaze you. And we pay all express charges. We go to the limit in liberality. We want you for our agent in your town, so that we can turn all our business over to you. We will start you in a big, established, money-making business. New agents make $40 a week. Do you wonder that our agents make all kinds of money? We must have an agent in your town. Get our Grand Offer and the Special Paragon Outfit, which is already packed with big Assortment of Cloth Samples and complete equipment, ready to be sent you free, charges paid by us. "First Come, First Served." Rush your answer to us quick if you want a suit for yourself, before some one else gets the prize. Address Dept. 11, Paragon Tailoring Co., Chicago, Ill.

WANTED—LIVE MEN AND WOMEN TO TAKE THE AGENCY for Tate's dust absorbing dust cloths, mops, brushes, etc.; great demand; everybody buys; 100% profit. Apply to Department B 4, Consumers' Direct Supply Co., Boston, Mass.

TRAVELING SALESMEN, AGENTS, ORGANIZERS, etc., may secure a highly profitable side line, paying $25 to $50 monthly and upwards. No samples to carry, no house-to-house canvassing. Will bring you in touch with the best people in every community. Full information sent. Address The Christian Herald, Sales Dept. O, Wide House, New York City.

500% PROFIT selling our wonderful sign letters for office windows, store fronts and glass signs; resembles finest gold leaf; easily applied; samples free. Metallic Letter Co., 400 N. Clark St., Chicago.

FREE SAMPLE goes with first letter. Something new. Every firm wants it. Orders from $1 to $100. Nice, pleasant business. Big demand everywhere. Write at once for free sample and particulars. Metallic Sales Co., 400 N. Clark St., Chicago.

WANTED RELIABLE PERSON IN EVERY CITY, Either sex to push the sale of new patent household articles; new ironing device; keyless door locks; umbrella clothes hars; combination shirt and trouser hanger; folding sleeve board; ideal toaster; sanitary water proof rugs, etc. $5 to $15 daily, easily made. Now is the time to get started. For particulars address, Dexter Supply Co., 508 S. Dearborn, Chicago.

10,000,000 U. S. HOMES NEED The Aladdin Mantle Lamp because they burn kerosene. Using less oil than ordinary lamps, the Aladdin outshines gas or electricity. Sells itself on overnight trial. Built gold $50 on money-back guarantee. Not one returned. Sample lamp furnished. Write quick for agency proposition. Mantle Lamp Company, Dept. 118-O, Chicago.

WANTED—AGENT. Man or woman, in every town to sell "Egypto Triple Series Neckwear, Five Ties for $1." The best advertised line of gents' neckwear in the United States sold direct to the consumer; goods sell on sight. Indianapolis Neckwear Co., Saks Bldg., Indianapolis, Ind.

AGENTS—Get six pairs guaranteed hose Free. Write for unparalleled special offer. Big money selling Triplewear Hosiery. Beautiful line, guaranteed six months. First application secures agency. Triplewear Mills, Dept. D, 730 Girard Avenue, Philadelphia.

AGENTS BIG PROFITS. Brandt's Patented Automatic Razor Stropper, automatically puts a perfect edge on any razor, old style or safety. Retails at $2. Big seller. Every man wants one. Write quickly for terms, prices and territory. F. Brandt Cutlery Co., 84 West Broadway, New York City.

AGENTS—LIVE AGENTS TO SELL "The American Lady Filter Brooms," on one year's guarantee; does away with corn brooms; exclusive territory; free samples; big, permanent business; one man in every county. F. L. Burt, 2255 S. State St., Chicago.

AGENTS WANTED to sell the Comfort Feed Bags. Excellent invention for feeding horses while hitched. Humane, economical and convenient. Every horse owner wants them. Liberal commission. Send $1.50 for sample outfit and mention territory desired. Expressage prepaid. Comfort Feed Bag Co., Manufacturers, 1031 Vine Street, Philadelphia, Pa.

MALE AGENTS, ANY KIND. This space is too small to tell how good our proposition is. Write. Novelty Sixty Three Company, 2561 Milwaukee Ave., Chicago.

AGENTS, CATCH THIS: Big money making permanent position; a high class household necessity just invented; investigate for your own interest. G. O. Beasley, B. 45, Weed, Cal.

NEW FAST SELLING SPECIALTIES for Mechanics, officemen and everyone. Something out of the ordinary. Demand already created. 400% profit. Samples 10c. La Rue Soap Co., 284 Niagara St., Buffalo, N. Y.

WANTED: 5,000 salesmen at once, $10 daily, easily made. Something new; cheap, simple, strong, neat. Only up to date Hame Fastener out. Every horseman wants it, greatest seller out; most liberal terms; apply at once. B. & B. Mfg. Co., Courtenay, N. Dak.

STOP! SELL WATCHES! Liberal commissions paid on standard makes. Easily sold in spare time. Stamp brings confidential prices, salary and premium offer. Winslow Catch Co., Boston.

$2,940.00 IN ONE SEASON made by one concern. McCullough made $420.00 in one week selling our bottling outfit to saloons. You can make big money. Write for information. Simplex Mfg. Co., Dept., Kewanee, Ill.

AGENTS: Give $5.00 automatic stropper free with every sale of our goods. New selling plan. Sells in home or office, town or country. Write for terms and free outfit. Thomas Mfg. Co., 1702 Third St., Dayton, Ohio.

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GREAT SUIT OFFER! Just write us and we will send you absolutely Free, by return mail, postpaid, a large outfit containing a big variety of cloth samples, fashion figures, tape measure, order blanks, etc. Everything Free, and we will start you in a paying business. A most liberal offer on a suit for yourself that will make you wonder. Terms, conditions and privileges that will astonish you. We will name you so much lower prices on men's fine clothing that it will surprise you. We want a live agent in your town. You can make $1,000 to $2,000 per year. If you will write us before we get an agent in your town you will get a wonderful offer. As soon as we get an agent in your town he will get profits on every dollar we sell in his territory. We turn all our business over to him. That's why our agents make so much money. If you want a suit for yourself answer quick before we get an agent in your town, and will then get all of our great inducements. Address Dept. 168, American Woolen Mills Co., Chicago, Ill.

WE MANUFACTURE FOUR FASCINATING GAME BOARDS. 100% profit. Orders repeat. Can be carried as side line where Candy, Pipes and Cigars are sold. Particulars free. Unique Novelty Co., Independence, Ia.

AGENTS—To handle remarkable money-getter; easy to sell; easy to handle; write today for particulars, illustrated catalogue, and confidential price-list. The F. A. Coyle Supply Company, Delavan, Illinois.

AGENTS—MAKE BIG MONEY, selling Congo-Lac. New waterproof coating for autos, floors and furniture. Applied with cloth. Write for territory. The Congo-Lac Company, Indianapolis, Ind.

AGENTS—CANVASSERS—Our Expense Records and Household necessities sell rapidly. Profits large; easily handled; big repeat business. Some territory still open. Samples free. Enclose stamp. Armstrong, Box 405, Springfield, O.

AGENTS—Men and women make big money. 50 to 500 sales in every office building. Almost every user of desk telephone pays quarter on sight for Empire Cord Holder. Sample 12c. Send today. Empire Supply Co., Chicago.

WE WANT ONE LIVE AGENT in every town—Something new; big money-maker for purchaser as well as the agent; sells at sight; get particulars. Kern Mfg. Co., Libertyville, Ill.

AGENTS, a first class self filling fountain pen, sells at sight, send 50c, we will send you sample pen and agents' terms. E. Gruber & Co., Stanwood, Iowa.

AGENTS: To sell Cinch tire repair kit for automobiles; big commission to hustlers; call or write today. Peyrot Novelty Co., 1029 Grand Ave., Chicago, Ill.

AGENTS, WRITE TODAY for discounts on Peerless Automatic Draft Regulator. Insures warm house when you arise. Every home with cellar heat should have one. Price $1. O. K. Lamifs, 423 Charlotte St., Lancaster, Pa.

AGENTS WANTED—To sell the new 3 in 1 Scrub Brush, Floor Mop and Wringer combined. Also 8 other original styles. 50 profit a day's work. Send name on postal to Hilker Mop Co., 1181-A, Grand Ave., Chicago. Free catalogue and sample.

AGENTS—Four in one is the best of the latest; no more burnt fingers; not sold in stores; every housewife buys; 15c gets 25c sample and prices. Money back if not satisfied. Progress Mfg. Co., 423 Main St., Elmwood Place, Cincinnati, Ohio, "Pat-entees."

AGENTS—JOBBERS—Help introduce three new household necessities. Samples, 25c silver. Redmum Novelty Co., 314 East 26th St., N. Y.

GERMAN SILVER POCKET KEY TAG, marked with your name and address, with key ring, 15 cents. We want you to take orders, 100% profit. We sell blank tags, steel letters, key rings, etc. Pease, Die Maker, Winchester, N. H.

LIVE AGENTS AND DEALERS, High-Grade, to handle Tungsten lamps, highest merit, lowest price, sells large quantities, factories, stores, hotels, buildings, supply houses. Agent must carry small stock. Large profits. Union Light & Supply Co., 89 S. La Salle St., Chicago.

24 MINIATURE PHOTOS copies from any picture sent us, 12 cents. Original returned unscaled. Reference, any Washington resident. Brooks Studio, 615 Pa. Ave., Washington, D. C.

SALESMEN ACQUAINTED WITH AUTOMOBILE OWNERS. Sell direct guaranteed cold weather auto starter. Easily installed; ready sale. Instantaneous Auto Starter Co., Cincinnati, Ohio.

WANTED AGENTS and Mail Dealers for new popular novelties with original moneymaking plans, working great everywhere. Columbia Novelty Mfg. Co., 1555 Wells, Chicago.

I MADE $20,000 in three years in the mail order business. Began small. Send for free booklet, tells how. No "outfit" scheme. H. Systems, 910, Marion, Kentucky.

PORTRAIT AGENTS find our plan beats all others. Prompt shipments—rejects credited. 30 days' Credit. Catalogue of Portraits, Frames, Pillow Tops, Sheet Pictures and Samples free. James C. Bailey & Co., Desk J, Chicago.

ONE MILLION AGENTS WANTED. Fast seller costs 5c, sells 50c. Every firm needs. Orders to $10. Postal brings samples. Enlowood Co., 2497 Milwaukee Ave., Chicago.

AGENTS—The best paying seller in America needed in every office, store and home, once tried always used. Liberal commission, ten cents brings full size sample package and agents' terms. Lenhan Mfg. Co., Ware, Mass.

THE MONEY-MAKER of the season. Make $5.00 to $15.00 daily. 100% profit. No little Tom foolery. Free particulars. Answer this ad in preference of others. Gross Mfg. Co., Dodge-Moore Blk., Desk "B," Greenfield, Ind.

LAMP, 200 HOURS OF LIGHT for 1 cent. Makes and burns its own gas from kerosene oil, which is vaporized by a glass bulb burner. Scientific wonder of the world. Lamps used where people have electric lights. Makes it possible to sell to every household. Lamp made entirely of brass. Sticks awaiting you. Rush $1.50, complete lamp will be sent, charges paid. We guarantee lamp as above stated, or your money returned. Town, county and state agents wanted. Lamp a whirlwind seller. Pat. U. S. A. and foreign countries. New Process Mfg. Co., Lamp Room 24, Salina, Kans.

WE WANT to start one good merchant or salesman in each town in the merchant tailoring business. We furnish a big complete sample outfit free, no cheap folder or catalogue but 500 large size samples, elaborate fashion portfolio and every necessary. No experience necessary, profits $3. to $15 a day. Unlimited possibilities. Write at once for exclusive selling agency. Dept. 87, McCall, Sales Manager, Lock Box 483, Chicago.

AGENTS: $6.00 to $10.00 DAILY. $2.00 profit each sale. One man sold eight first day. You can do as well. Wonderful invention cuts butter bill in two and gives far superior product. Easy to operate. Every woman is interested in a household device that will actually save her money. Be the first in your territory and reap the harvest. Your letter brings testimonials, guarantee and special trial offer. Write today: American Supply Co., 35 N. Dearborn St., Chicago.

SIGN LETTER AGENTS—Painters. Something new and better. Attracto Gold or Silver Letters. Anyone can apply them. Big money lettering store windows—making glass signs. Write today for free sample and catalogue. Attracto Sign Co., 2655 N. Clark Street, Chicago.

LIVE AGENTS WANTED—HUSTLERS to handle our attractive 1912 combination packages of soap and toilet articles with valuable premiums. One Michigan agent made $65 in 47 hrs.; another $21 in 8 hrs.; another $22.50 in 10 hrs. Write today. Davis Soap Works, 204 Davis Bldg., Chicago.

AGENTS MAKE 500% profit selling our gold window letters, novelty signs and changeable signs. 800 varieties in enormous demand. Catalogue free. Sullivan Co., 1238 Van Buren St., Chicago, Ill.

AGENTS—$30.00 WEEKLY; great advertising campaign introducing business with premium coupons; easy for beginners; big money for hustlers. Family Portrait Co., Dept. P. M., Wayne, Ill.

AGENTS, EVERY DEMONSTRATION of our new Inverted Gas Burners or Kerosene Mantle Burners makes a sale with large profits. Positively fastest money makers on the market. Particulars free. Simplex Gaslight Co., 1 Park Row, New York.

TAILORING SALESMEN WANTED to take orders for our Guaranteed Made-To-Order Clothes. Suits—$20 up. No capital required. Write today for territory and complete equipment. Address Washington W. & W. Mills, 173 Adams St., Department 480, Chicago, Ill.

THE MAIL ORDER MAN (magazine) and big offer of how to add $5 to $50 weekly to your income through mail order business, all for 10c; none free. Beenber, 908 Chestnut, Philadelphia.

EXCLUSIVE SALE will be given of an unusual meritorious article which sells on sight. A permanent and lucrative business can be built up by any man who isn't positively lazy. Every home and office a possible customer. Act quickly or you lose it. Marrel Mfg. Co., Springfield, Mass.

AGENTS WANTED EVERYWHERE. Hustlers make large quick profits. New Automatic Stropper puts a perfect edge on any razor, safety or old style. Absolutely guaranteed. Every call a sale. Write today for territory (state or county). S. O. Kanner, 552 Broadway, New York.

GREATEST SENSATION OF THE YEAR! New invention. Every auto owner buys. Agents make 100% profit. Easy to demonstrate. Particulars free. Sample prepaid $1.00. Buckeye Auto Accessories Sales Co., Toledo, Ohio.

PERFECTION POCKET ADDING MACHINE, lightning seller. Agents wanted. Cincinnati Specialty Mfg. Co., Dept. E., Cincinnati, Ohio.

AGENTS—MAIL ORDER DEALERS—Make big money selling fountain pens, best seller out, profits enormous. Sample 25c. Dozen $1.95. Post Supply Co., Waltham, Mass.

PIGGY WANTS A PENNY. Toy Banks. Sample 14 cents prepaid. Agents wanted. Devonshire Novelty Co., Akron, Ohio.

"ALCA," the famous $6.00 Vacuum Cleaner, seeks a few more selling agents to show its merits and promises prosperity and success in return. Write for gilt-edge proposition. Alca Co., 380 W. 56th St. (Dept. 35), New York.

AGENTS: $35 a week for 2 hours work a day selling wonderful new household necessity, new selling plan with free advertising does it. Collette Mfg. Co., Box M. A., Amsterdam, N. Y.

WANTED—AGENTS to send 25c stamps for sample of my Daily Expense Record and terms to agents. Sells 25c. Big profits, big seller. A. J. Crago Specialty Co., Main St., Crago, Mich.

PICTURE AGENTS. $60 week easy. 20x24 Framed Religious, Art, Scenic Pictures, complete, 15c. Portraits 25c. Catalogues, Samples Free. Berlin Art Association, Dept. 26, Chicago.

SUCCESS IS YOURS if you work our new mail order plan. Particulars free. Write today. Chromatoscope Co., Dept. B, Norwalk, Conn.

EVERYBODY NEEDS RUBBER STAMPS. Big money making them. Simple process. Vulcanizers, $5 up. Circulars free. Central Stamp Works, Newcastle, Ind.

QUICK SELLER. See advertisement under "Printing," Clifford Press.

SIGN LETTER AGENTS—Painters: Our "classy" new window letters are money makers. Samples free. Attracto Sign Co., 2655 North Clark St., Chicago.

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AGENTS, INVESTMENT $11 NETS $20 Daily, selling new flash light pavement signs, projectors; sells everywhere. Electric Co., Heed Bldg., Philadelphia.

AGENTS, GET OUR CATALOGUE and free sample. Unlimited opportunity and profits. Boston Sales Company, Box 2127, Boston, Mass.

AGENTS, MAKE $20 A DAY. Every automobile owner buys the Clinch repair kit for punctures. 1456 West 11th St., River Side, Calif.

AGENTS, to sell 50 candle power smokeless, odorless lamp and lantern burners. Sample 30c. White Flame Co., Kansas City, Mo.

$100 MONTHLY and expenses to trustworthy men and women to travel and distribute samples; big manufacturer. Steady work. S. Scheffer, Treas., G. W., Chicago.

AGENTS, BUY DIRECT FROM FACTORY, fastest selling article ever produced; large profits, permanent business. A post card will bring you full particulars. Eden Mfg. Co., Brooklyn, N. Y.

AGENTS WANTED EVERYWHERE—To sell high grade household necessity, $18 to $50 weekly. Large demand. Quick sales. Particulars free. Ross Specialty Co., Belvidere, N. J.

AGENTS—Sell Penny Gift Gum. Outfit, 3 styles, 600 pieces, $1.50. Write quick for territory. Austin Mfg. Co., Cranston, R. I.

NEW DEVICE REPAIRS PUNCTURE in one minute. Sells at sight. Agents average $10 to $25 daily. Write for booklet. Kimball, 112 Adams St., Brockport, N. Y.

AGENTS WANTED—Article sells at sight. Two to six in every home. 100 per cent profit. Barchell Distributing Company, Box 57, Lima, Ohio.

WANTED, AGENTS—To sell Farmers' Account Book. Quick Seller, Big Paying Proposition. Act quick. Address L. L. Syphers, Fort Wayne, Indiana.

AGENTS WANTED. Have splendid proposition for agents, easy seller, pays good fat profit; full particulars for the asking. Arthur C. Morey, Bantam, Ct.

AGENTS—Double your money with this attractive 50c kitchen utensil. Six articles in one. Absolutely new. Outfit, mailed, 40c. Proposition free. Malaney Company, Cleveland, Ohio.

BOTTLES—CORKS—LABELS—Boxes, Cartons and supplies for mail order business. State your needs. M. Bousall Co., Baltimore, Md.

"PREVENTO" positively prevents steaming eyeglasses. Sample 25 cts. Samuels, Optician, Wilkes-Barre, Pa.

AGENTS. We have a money making proposition to offer you for selling our goods. Write. Guard Sales Co., Phoenixville, Pa.

MAKE EASY MONEY Recutting Old Files. Secret process. We teach you for $1. Covert, 1900 8th Ave., Beaver Falls, Pa.

CLAY COOKING SET. Big profits. Pace Pottery Company, Roseville, Ohio.

AGENTS—Embossed Gold and Silver Sign Letters. Immensely profitable. Sample free. Johnston Co., Quincy, Ill.

MAN WANTED, to sell Baking Powder. Large commissions. Mail us 35c for $1.00 outfit. Prudential Baking Powder Co., Hudson, Canal and Desbrosses Sts., N. Y.

AGENTS: Sell our quick Tire Repair Kit to automobile owners. Slaten and McDow, 407 Morgan, St. Louis, Mo.

AGENTS, PORTRAITS 35c, FRAMES 15c, Pillow Tops 30c. Best work and service. Catalogs free. Sheet Pictures 1c. Central Portrait Co., 2009 Wilcox Ave., Chicago, Ill.

DID YOU EVER hear of anyone selling popular 25c sheet music at 5c? You can do it and make 300%. Four sample copies and proposition, 10c. People with pianos can't resist you. Best thing yet. Chicago Music Co., Hyde Park, Chicago.

NOVELTY STORES, send for a Whisler Broom Holder. Just out, sells at sight, 15 cents postpaid to anyone. Get agents' prices. John Whisler, Gilson, Iowa.

AGENTS WANTED EVERYWHERE for easy selling $5 proposition. $10 daily easily made. Particulars free. Local Mfg. & Supply Co., Holland, Mich.

AGENTS—Either sex, your opportunity—Earn $3.00 daily, selling our line of Women's Specialties. William Bowman, 522½ North St., Richmond, Va.

AGENTS—Young Folks' Novelty, new invention, large profits, no competition; other staple articles, sells everywhere. Particulars free. Box 434-M, Crookston, Minn.

SIGN PAINTING AGENTS. 1,000% profit. Best and cheapest window letters made. Easiest mounted. Outfit free. Success positively guaranteed. Embossed Letter Co., 2561 Milwaukee Ave., Chicago.

WE WANT LIVE AGENTS to sell our high grade specialties. Write quick. Box 259, Greenwich, Conn.

SELLS EVERYWHERE. Agents write Trolley Manufacturing Company, 367 Beaubien, Detroit.

AGENTS—$5 daily selling our Handy Tool, 12 articles in one. Lightning seller. Sample free. Thomas Mfg. Company, 462 Third St., Dayton, Ohio.

AGENTS, don't accept an agency. It will pay you to send stamp for booklet. G. Tibbetts, Putnam, Conn.

DRY GOODS REMNANTS supplied to agents and storekeepers. Bargains only; all sellers. Remnant Store, 1301 Linn St., Cincinnati.

SLIDE-EASY NECKTIE DEVICE, just out. Agents' sample, 25c. Priess Mfg. Co., Minneapolis, Minn.

AGENTS—Big money distributing free pkgs. Borax-ce Soap Powder. D. Ward & Co., 1270 Berteau, Chicago.

AGENTS WANTED—Send 25 cents silver for Cigar and Gas Lighter and one of each of our catalogues with Terms to Agents. A. S. Mankin & Co., Alexandria, Va.

AGENTS TO SELL high and low-priced cigars, box lots. Kramer Company, Heed Bldg., Philadelphia.

AGENTS—SIGNISTS. IMMENSE PROFIT. Beautiful window letters. Very low prices. Easy proposition. Business-getting guarantee cards, glass sample free. Bordeaux Co., 2561 Milwaukee Ave., Chicago.

AGENTS, MALE AND FEMALE, to sell novelty pencil. Supplies its own memorandum paper instantly. Catalogue, premium offer and sample, 25c. Henry H. Dines, Brattleboro, Vt.

AGENTS—DON'T accept an agency until you read our new book, "Piling Dollars;" it's Free. Darling Bros., Derry, N. H.

BE A GUN MAN. Sell our Cowboy Watch Fobs, Genuine Strap Leather Holster and Miniature Six Shooter. Immense profits. Send 25c for sample and quantity prices. Publishers' Clearing House, 35 So. Dearborn, Chicago.

GUILFORD KEROSENE MANTLE LAMPS—America's largest variety. None better. Burners fit ordinary lamps. Supplies for all mantle lamps. No city prices. Guilford Co., Seville, Ohio.

AGENTS—To sell Automobile Tire Removers; it will do the trick in one minute. The Barnes Mercantile Company, Webster, Massachusetts.

FORMULA FOR SHAMPOO, 10 cents; makes hair light and fluffy; 5 cents makes 10 shampoos. Mad Company, Washington, D. C.

A WINNER: Mail Box Simply Signal. Sells on sight. Mail man's delight. Send 15c for sample. Mail Box Supply Co., Perry, Mich. Box 217.

AGENTS. Big easy profits selling Gold Window Letters. Mounted sample free. P. M. Ward Co., Dept. 6, 2559 Milwaukee Ave., Chicago.

ARTICLE SELLS ON SIGHT, needed in every home, office and factory. 100% profit. Vangold Supply Co., Dept. 2, Alexandria, La.

WILL SEND BIG SET winning Mail Order Plans on approval; $2.00 if accepted, otherwise return. Include 7c actual postage. Specialist, Box 1015, New York.

BIG MONEY for salesmen everywhere. Burlington Repair Works, Burlington, Kans.

AGENTS WANTED. Hustlers only. 100% profit. Particulars free. Rinehart Co., 3030 15th St., Washington, D. C.

AGENTS, Sell Advertising Novelties, 25% commission. 2 samples 10 cents. Just Kenyon, Owego, N. Y.

AGENTS WANTED to sell State rights for Evaporative Cooler. J. H. Collett, Eddy, Texas.

FORMULAS FOR ANYTHING, 20c each, four for 50c. Hyman, 417 National Safety Vault Bldg., Denver, Colo.

AGENTS. Sell new household necessity. Samples free. J. Fenstermacher, Hamburg, Pa.

AGENTS WANTED—New Automobile Specialty. Box 217, Albany, N. Y.

AGENTS, SELL BRIGHTERSHINE METAL POLISH, one package makes half pint best liquid metal polish, sample 10c. Leroy Brown Co., 1210 E. Madison, Baltimore, Md.

AGENTS wanted. Fine line. Crosby Co., Box A, North Conway, N. H.

EARN $15 TO $25 A WEEK or more as our Mail Order Dealer. Right from your own home. Hold your position until entire time is required. We are manufacturers and owners of patented just-in-season specialties. If you are just starting a Mail Order Business or if already established, you can't afford not to handle our Patented Money Making Getters. We sell exclusively to our Mail Order Dealers. We protect them. We carry stock and furnish everything. No canvassing. Small capital. Experience unnecessary. Write today for Latest Patented Leader and Manufacturer's Easy Selling Mail Order (copyrighted) plan backed up by "Whole Truth," Positive Proof and Sworn Statement. J. M. Pease Mfg. Co., 789 Pease Bldg., Michigan St., Buffalo, N. Y.

EXCLUSIVE TERRITORY NOW BEING ALLOTTED for Little Giant Lift and Force Pump. Only thing of its kind, it has free field wherever there's plumbing. Removes all stoppages in pipes, saves plumbers' bills, prevents noxious gases. Everyone wants it, everyone can afford it, everyone can operate it. As strong in business world as among homes. Selling at top speed. 50,000 already in use. I can grant you absolute monopoly and fix you for life, if you are the right man. Address at once, J. E. Kennedy, Dept. P, 41 Park Row, New York City.

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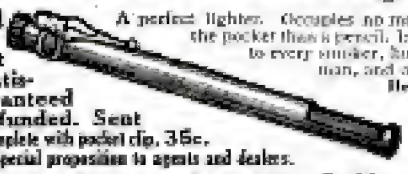

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Checks will be sent on the last day of each month for the prize articles received during that month. Publication in the magazine will follow in about two months.

PRIZES AWARDED FOR JANUARY, 1912

First Prize—P. D. MERRILL, Chicago.....$10
"Sifting Ashes"

Second Prize—A. W. ABRAHAM, Los Angeles, Cal.....$5
"Removing Splinters from the Flesh"

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J. J. O'BRIEN, Buffalo, N. Y.....$5
"Water Cooled Bearing Cap"

FRANCIS CHETLAIN, Chicago.....$5
"Door Key for a Round Hole"

CHAS. SCHAFFNER, Chicago.....$5
"Automatic Magnetic Lathe Dog"

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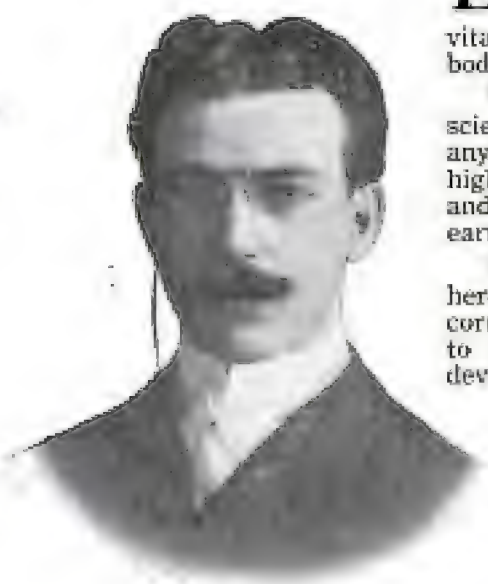

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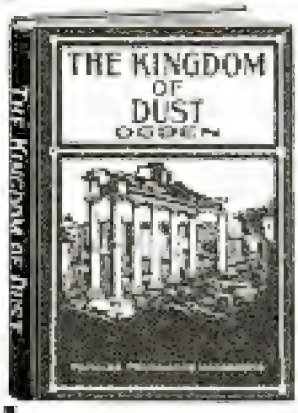

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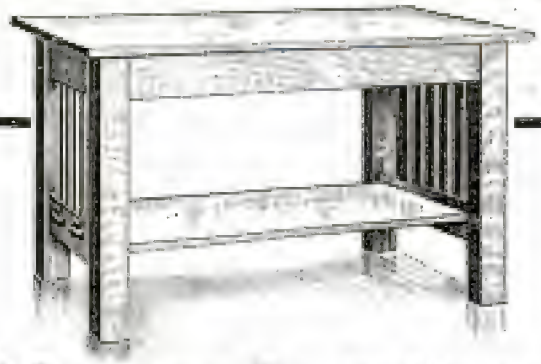

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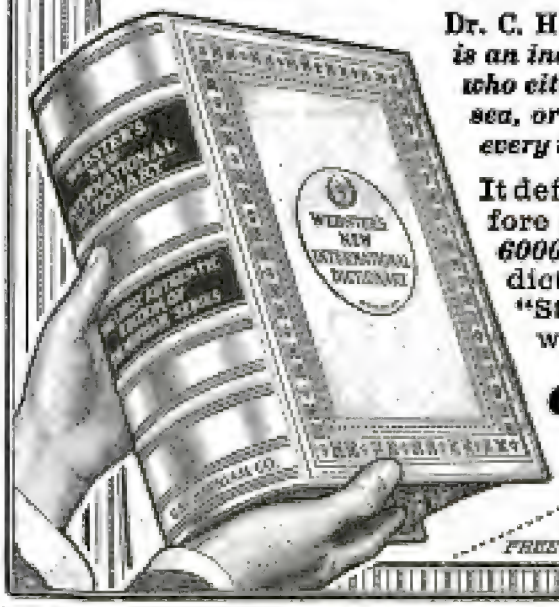

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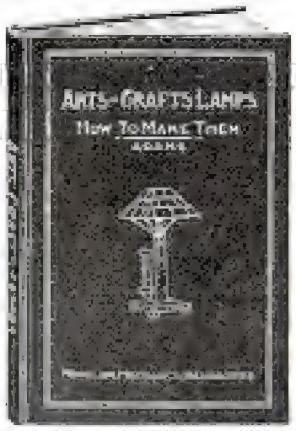

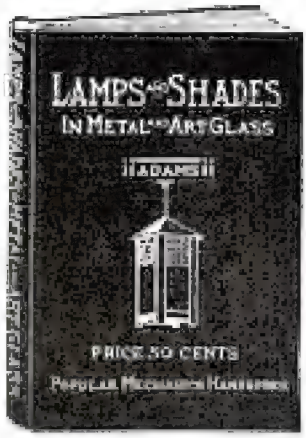

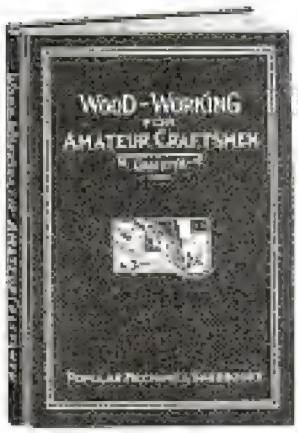

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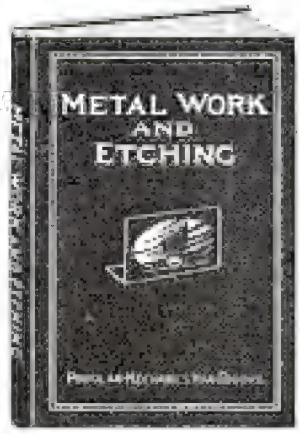

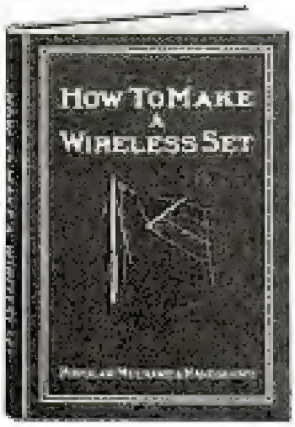

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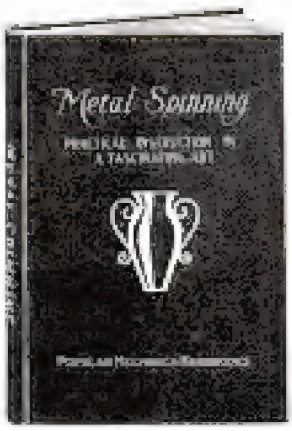

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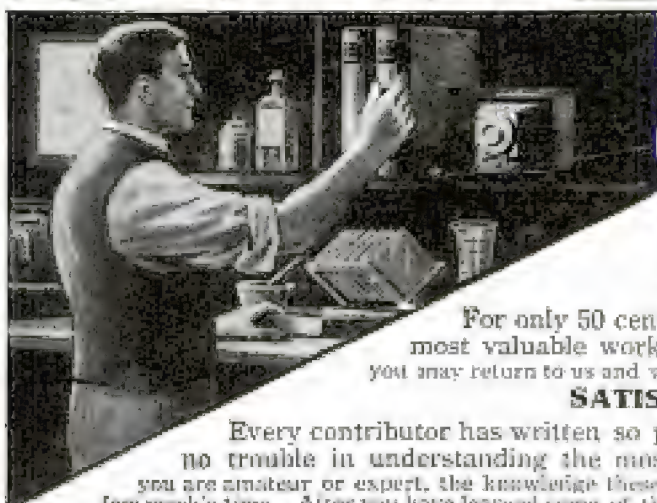

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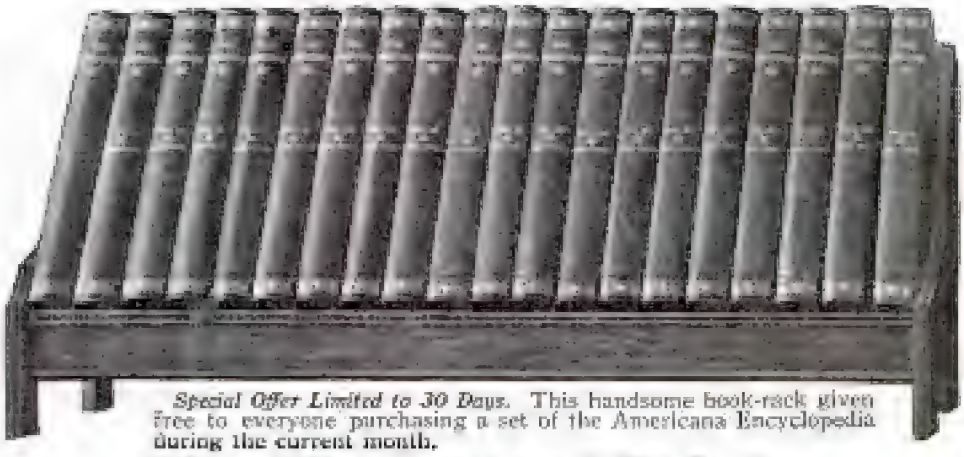

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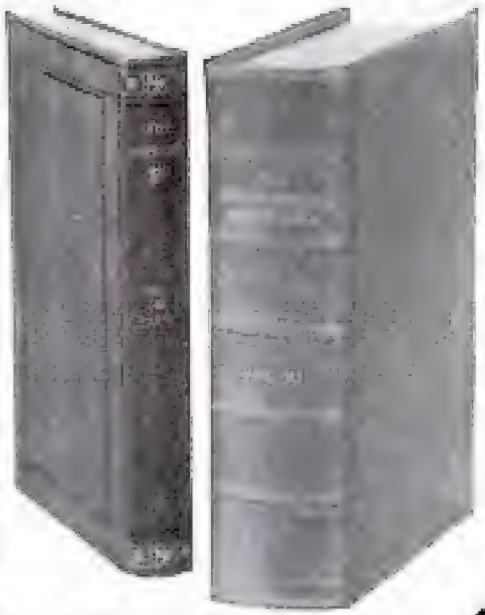

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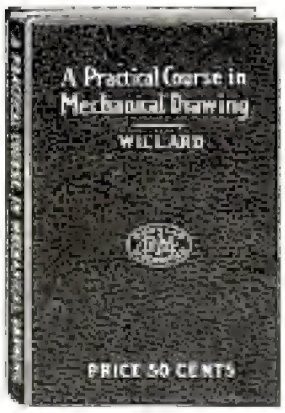

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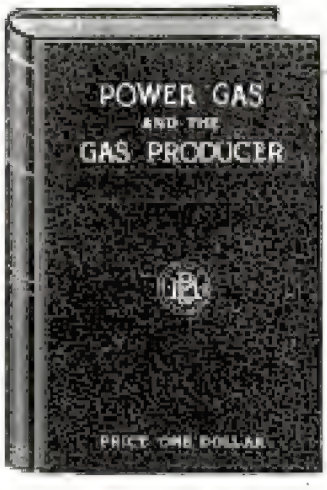

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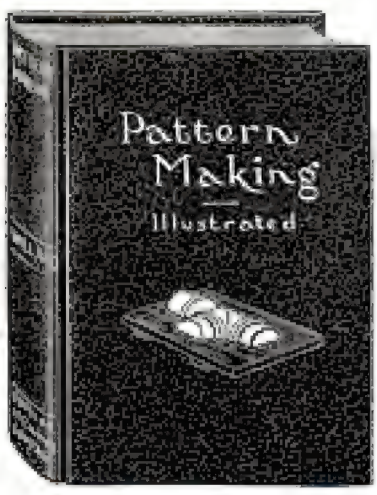

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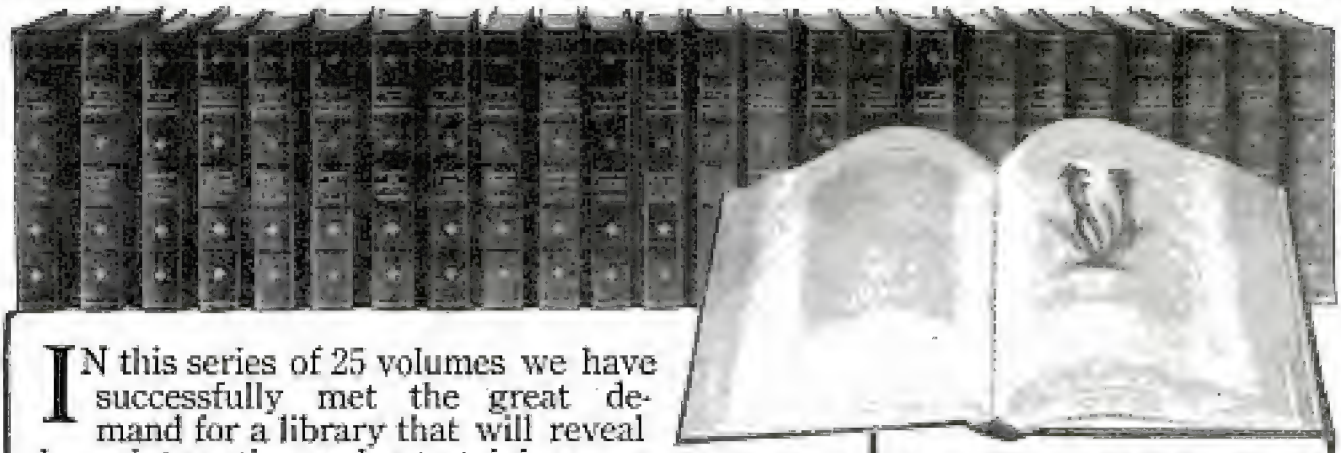

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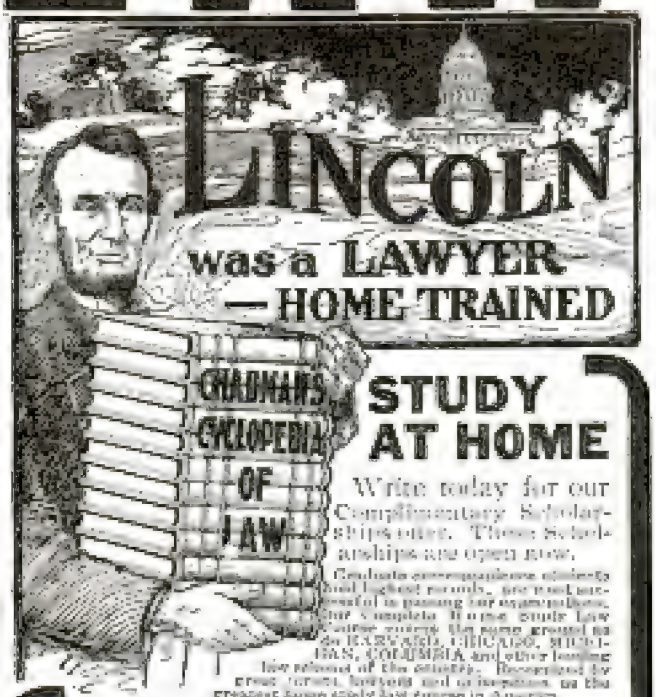

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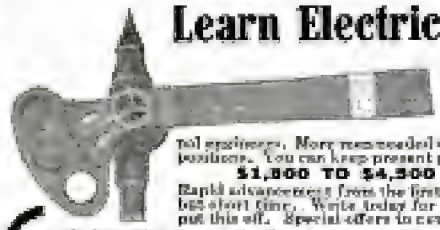

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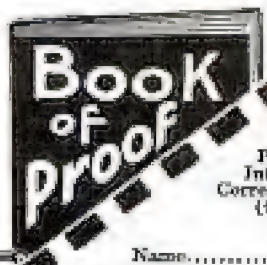

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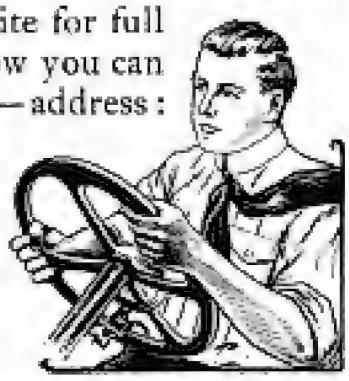

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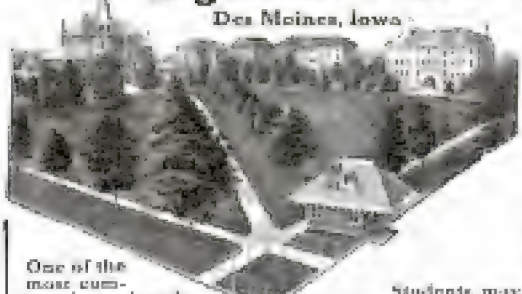

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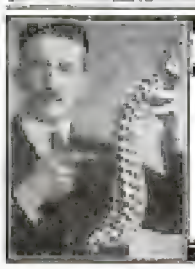

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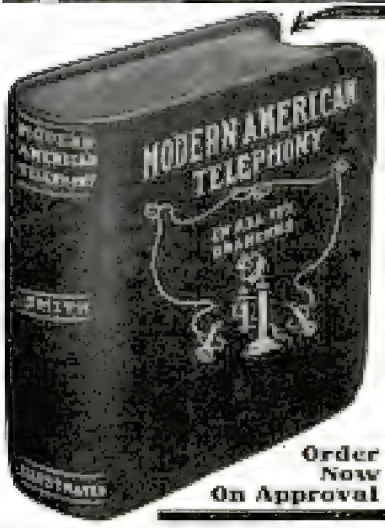

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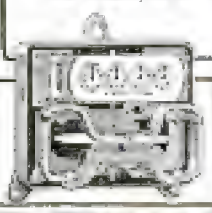

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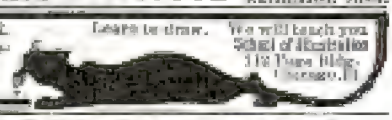

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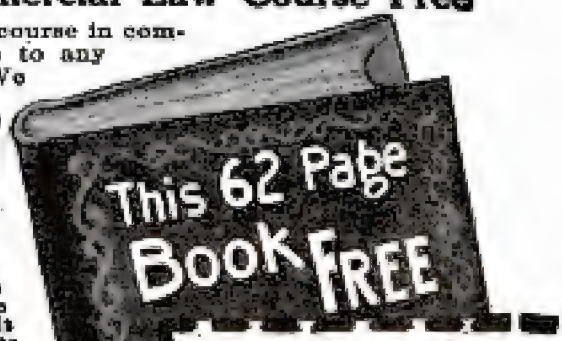

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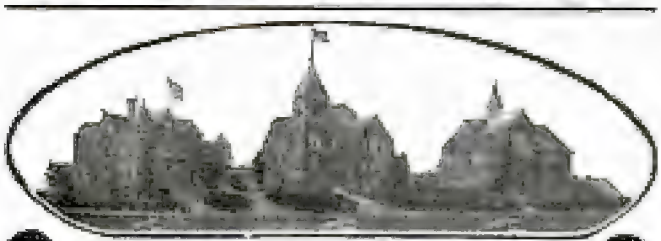

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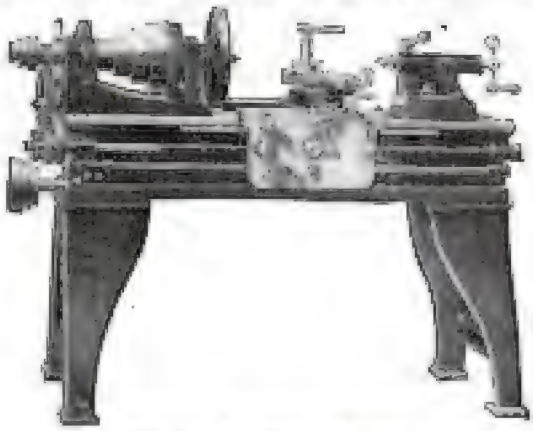

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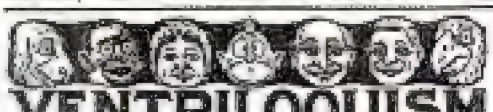

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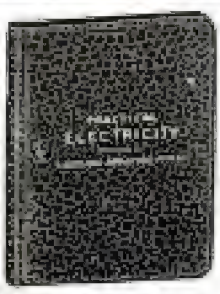

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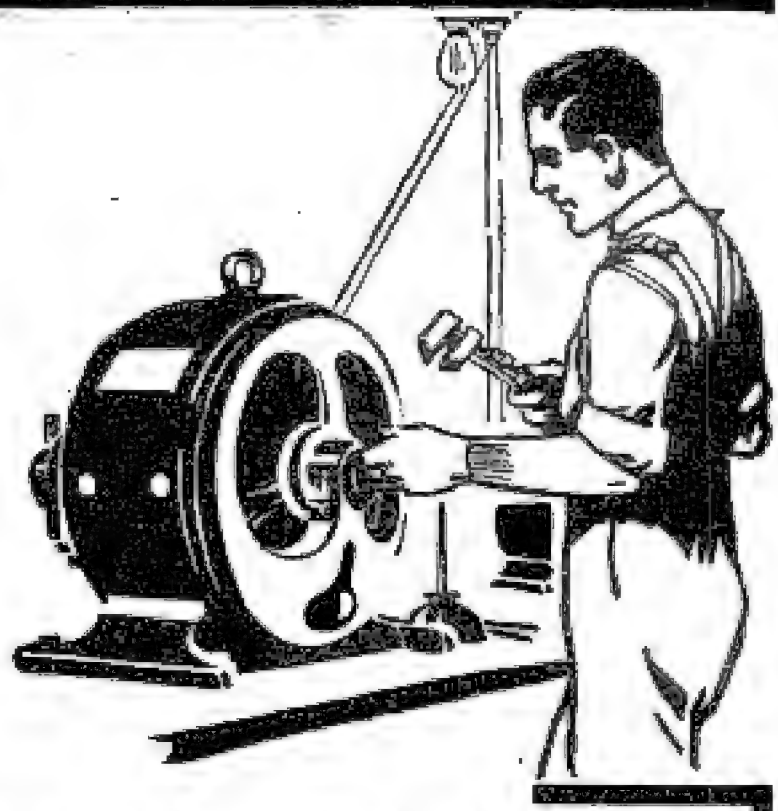

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Popular Mechanics Magazine

WRITTEN SO YOU CAN UNDERSTAND IT

Vol. 17 MARCH, 1912 No. 3

Steered His Ship with Packing Cases

Alaska Skipper's Emergency Steering Gear

THE ingenuity and resourcefulness of Captain Achton Jochimsen, master of the little power schooner "Duxbury," bound from Nome to Seattle with 14 passengers, saved the vessel and the ship's company recently when apparently all odds were against the craft.

The "Duxbury" sailed from Nome, November 6, and two days later left St. Michael, southbound. She ran her nose into heavy weather from the start. The fourth day out, in Bering Sea, during a terrific gale, the rudder was carried away by a huge wave. For six days the "Duxbury" drifted helpless in the gale, driving down toward the Pribilof Islands. During those six days Captain Jochimsen was a busy man.

Schooner "Duxbury" at Her Dock in Seattle, after a Remarkable and Most Perilous Voyage from Nome

He ordered the main boom taken off the main mast and lashed cross-ships over the roof of the after house so that an end protruded some distance on either side of the vessel. He brought out two big wooden packing cases from the hold. From the forward rigging on either side of the bow he ran a stout line aft to the ends of the boom to steady it. Across the boom,

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which ran cross-ships, he rigged a free-running tackle that was fastened at the outer end to the tops of the boxes and aboard ship took a turn about the drum of the steering wheel.

With this rig, when the wheel was turned to starboard the box on the starboard side was lowered into the sea and quickly brought the schooner's nose about. A turn to port hauled her over on that course. The rig served to take the "Duxbury" to Dutch Harbor, Unalaska, where she arrived November 24. At Dutch Harbor a permanent rudder was rigged and the schooner reached Seattle on December 12, with all hands well and full of praise for the ingenious master.

ELECTRICITY HAS PART IN CARDINAL'S WELCOME

St. Patrick's Cathedral in New York Illuminated in Honor of the Home-Coming of Cardinal Farley

Not the least impressive feature of the welcome extended Cardinal Farley on his recent return to New York was the illumination of St. Patrick's Cathedral, the seat of the archiepiscopal diocese of New York over which the new cardinal has for so many years presided and where he will continue his duties as archbishop, although now a cardinal. The cathedral is a structure of great dignity in architectural design. On the evening of the day the cardinal returned home its beautiful outlines were illuminated with 50,000 incandescent lights and formed a brilliant spectacle. The spires, crosses, buttresses and the lines of the Gothic decorations were illuminated with rows of lights.

MAMMOTH CONCRETE FREIGHT HOUSE

One of the largest private freight houses in the world has been erected by a concern in Buffalo, and will be used exclusively for the receiving and shipping of freight. It is also one of the largest buildings ever constructed of reinforced concrete, having a height of 10 stories, a length of 588 ft., and a width of 109 ft.

POWER SAW PULLS SELF THROUGH FOREST

A new gasoline-driven drag saw which pulls itself from tree to tree in the forest is being marketed by a Portland, Ore., concern. The machine, which comprises a gasoline engine, the sawing mechanism and a cable drum, is mounted on a skid or sledge. By attaching the cable to a tree and

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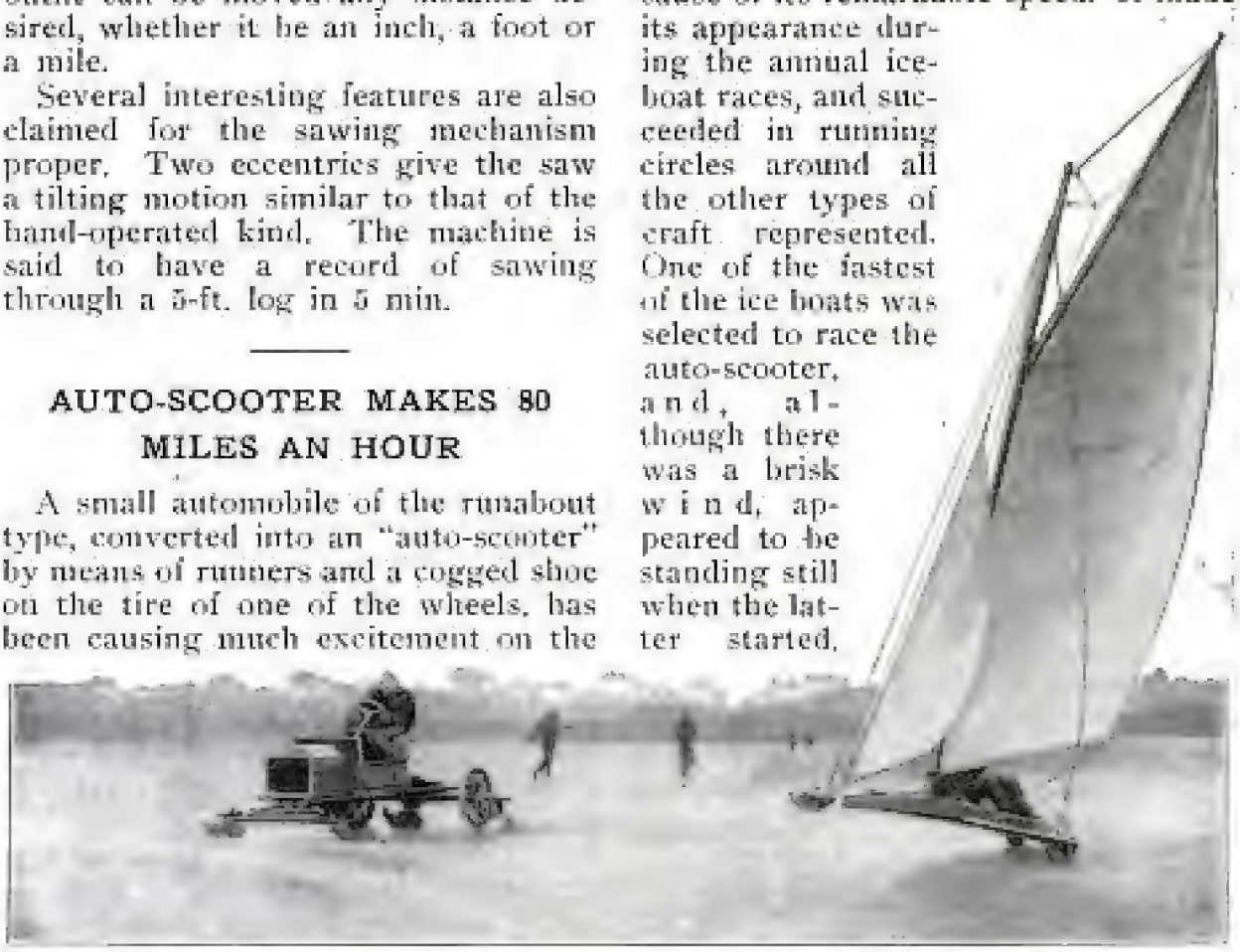
This Power Saw Drags Itself from Tree to Tree by Winding in a Cable Attached to the Fallen Trunk It is to Cut Up

throwing the power to the drum, the outfit can be moved any distance desired, whether it be an inch, a foot or a mile.

Several interesting features are also claimed for the sawing mechanism proper. Two eccentrics give the saw a tilting motion similar to that of the hand-operated kind. The machine is said to have a record of sawing through a 5-ft. log in 5 min.

AUTO-SCOOTER MAKES 80 MILES AN HOUR

A small automobile of the runabout type, converted into an "auto-scooter" by means of runners and a cogged shoe on the tire of one of the wheels, has been causing much excitement on the Shrewsbury River, New Jersey, because of its remarkable speed. It made its appearance during the annual ice-boat races, and succeeded in running circles around all the other types of craft represented. One of the fastest of the ice boats was selected to race the auto-scooter, and, although there was a brisk wind, appeared to be standing still when the latter started.



A Small Runabout, Converted into an "Auto-Scooter" by Attaching Runners to the Axles and Placing a Cogged Shoe on the Tire of One of the Wheels, Made a Speed of 80 Miles an Hour When Racing on Ice Boat on the Shrewsbury River, New Jersey

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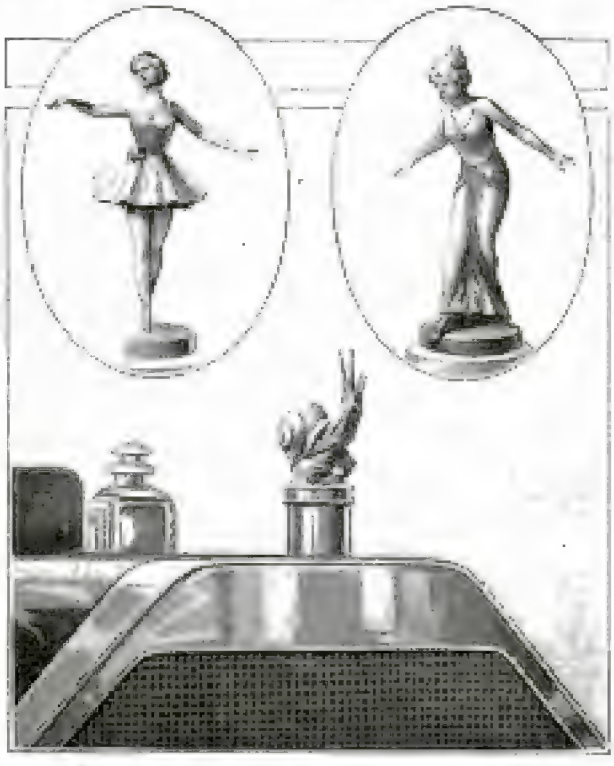
A speed of 80 miles an hour, it is claimed, was maintained by the auto-scooter for more than half an hour.

The remarkable machine is owned by a resident of Red Bank, N. J., who, in equipping it with runners, did so because the ice offered a better surface for traveling than the rough roads, and not with any idea that it would be remarkably speedy.

The four solid runners, fitted with steel shoes, and attached to the axles of the runabout, and the cogged shoe, placed on the tire of one of the wheels, were made by him.

DANCING MASCOTS FOR MOTORISTS

Motoring mascots are still growing in popular favor in Europe, although they have not yet made a general appeal to the fancy of motorists in this country. One company in London has placed a new line of mascots on the market, which may be obtained in bronze, silver or goldplated metal. Two interesting models are shown in the accompanying illustrations, one being a Greek dancer and the other a conventional ballet dancer.



A Snail and Two Dancing Mascots

WHY THE CONTINENTS DO NOT SINK

In a remarkable piece of work carried out recently by the U. S. Coast and Geodetic Survey, largely under the direction of Prof. John F. Hayford, it has been shown that the material of which the continents are made and that which lies under them is lighter than that which lies under the oceans. This explains why the continents do not sink though they are several miles higher than the ocean beds and exert enormous pressures on the material beneath.

The work of Hayford proves that the total amount of matter in a column of given size, reaching from the tablelands of the continent to 100 miles below the surface of the sea, is the same as that of a similar column reaching from the surface of the ocean to the same depth. This means that the continents are lighter than the ocean beds and that they are floating, as it were, upon the denser material of which most of the earth is made. The average density of a continent is about 2.75 times that of water, while the average density of the whole earth is 5.53 times that of water.

The balance of the continents is continually disturbed as they are washed down into the sea by the rivers. The Mississippi River, for example, carries into the Gulf of Mexico every year about a cubic mile of material brought down from the mountains and thousands of hills by the Missouri and its many other tributaries. The weight of the continent is decreased by this amount. Consequently, it has a tendency to float higher, just, as a ship rises when a part of its load has been thrown into the water. This process continuing for the hundreds of thousands of years of geological time leads to the elevation of new mountain chains and plateaus. Of course the process is, on the whole, very slow; but now and then the rocks break under the strains to which they are subject and slip by each other a little distance, and when they do, vibrations

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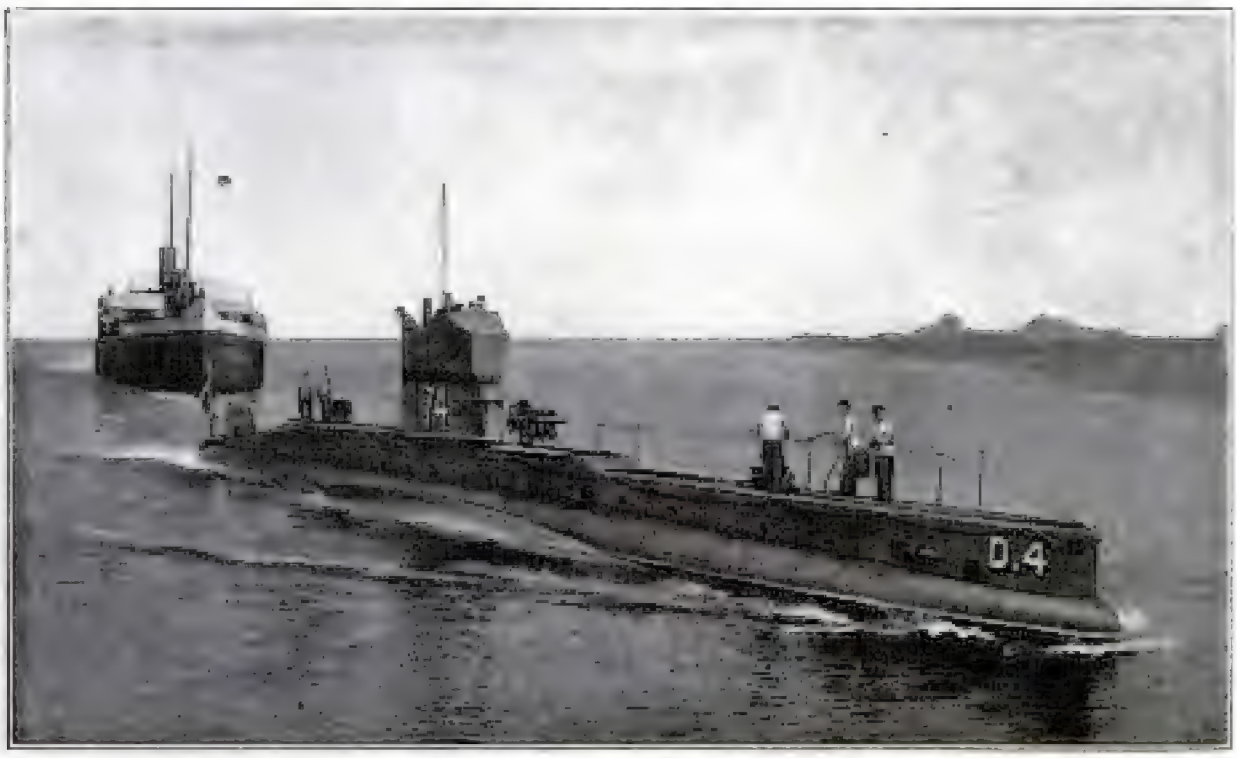

The Rapid-Firing Gun in Position for Action while the Submarine is Running on the Surface

are set up which are transmitted through the rocks and become what are called earthquakes. If the break is big enough and the change is sudden enough, the vibrations are so violent that they shake cities into ruins. The slip which caused the California earthquake in 1906 was one of about 10 ft.

SUBMARINE CARRIES DISAPPEARING GUN

The British submarine "74," claimed to be the most powerful submarine in the world, is the first ship of its kind to carry a gun other than a torpedo gun, and is also probably the first war vessel on which the disappearing-gun principle has been utilized. But while the reason for disappearing guns in coast defense is to mask them from the enemy, thus providing additional protection for both guns and crews, the idea is adopted on the submarine because the gun must be inclosed within the vessel when it is submerged.

Submarine "74" is exceptional in its length, being about as long as a torpedo-boat destroyer. Her surface speed is about 17 miles an hour. The illustrations show the quick-firing gun being pushed upward through the deck, the hatch doors being swung back, and the gun in position for action.

The Disappearing Quick-Firing Gun of Great Britain's Most Powerful Submarine being Raised through the Deck

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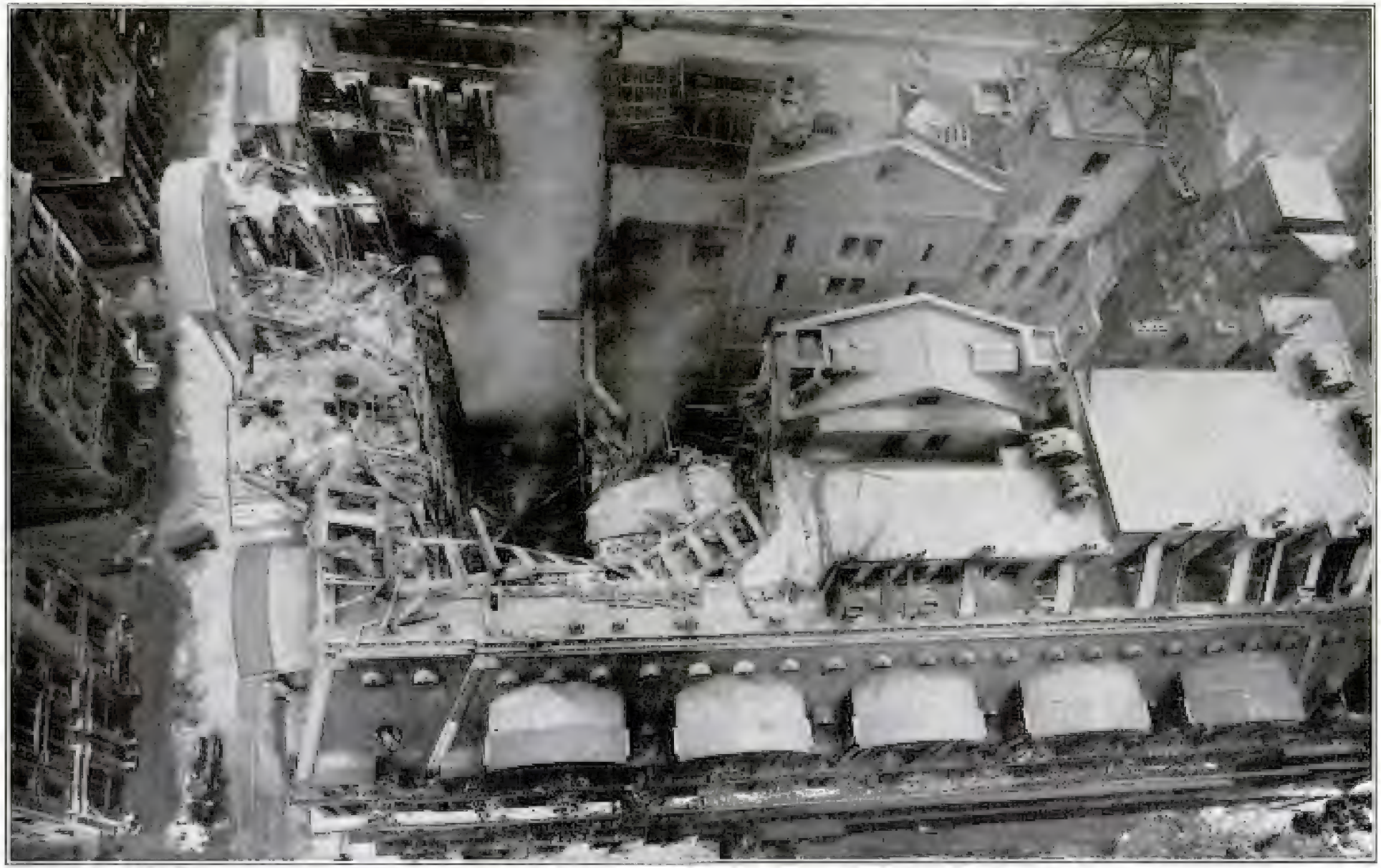

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Remarkable Photograph of the Equitable Building Ruins, Taken from the Top of a Near-by Skyscraper

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A FIRE WHICH ENDANGERED FIVE BILLIONS

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The Front of the Building, Thickly Coated with Ice, Looked Like a Canadian Ice Palace

The Ice-Covered Fire Engine Indicates that the Firemen Had to Fight Ice as Well as Fire

The Equitable Life Assurance Building fire, which occurred Jan. 9, killing six men and destroying property at first estimated to be worth from $12,000,000 to $15,000,000, but later conceded to be many millions below this figure, was one of the most spectacular ever occurring in New York's financial district.

The building, constructed of marble and granite, was a landmark of New York's earlier period of skyscrapers, located at 120 Broadway, in the very heart of the financial district. The fire, which started during the early hours of the morning, upset the financial machinery to such an extent that business was practically suspended throughout the day. The fire started in a café, located in the basement.

Particular interest centered about the fire because of the vast wealth stored in the vaults of the Mercantile Safe Deposit Co., which were buried many feet deep under the ruins of the structure. According to an estimate made by W. B. Brenner, assistant treasurer of the Equitable Life Assurance Co., which controls the Mercantile concern, this wealth, consisting of securities, stocks and bonds, represents a probable value of $5,000,000,000, which would, if converted into currency, be twice as much as is in circulation in the United States. It would pay the national debt and leave a balance greater than the combined fortunes of John D. Rockefeller, Andrew Carnegie and J. P. Morgan. No fear was felt for its safety.

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"SUB ROSA," OR THE ROSE AND THE THIEF

Every rose has its thorn and in this particular instance it consists of an ingenious hook which can be made to

The Rose as a Hiding Place for Stolen Rings

protrude from the center and drag such unconsidered trifles as diamond rings into the hollow depths veiled by the rose petals. The hook is operated through the stem of the imitation rose.

MOST POWERFUL POISON KNOWN

The most powerful poison known is reported to have been extracted by a German chemist from the seeds of the ricinus, the familiar castor-oil plant, and has been attracting much attention on account of its remarkable properties. Its power is estimated to be so great that a gram—about a thirtieth of an ounce—would kill a million and a half guinea pigs. If administered so as to cause severe illness without death, it gives immunity against a larger quantity, and the dose can be gradually increased until more than a thousand times as much can be endured as would kill an untreated animal. Though arsenic, morphine and other poisons can be taken in larger and larger quantity, nothing approaching this marvelous increase in dose can be borne. The ricinus poison has effects much like those of living germs, and in immunized animals an antitoxin is formed, so that injections of their blood serum may cure animals that are already in danger or have become ill from ricinus poisoning.

"TROUBLE-FINDER" HEAD LAMP FOR MOTORISTS

This "trouble-finding" head lamp for motorists, recently placed on the market in France, has become very popular. In the center of the metallic mirror is attached a small electric lamp, and the combination is firmly held to the head or cap by means of an elastic band. The whole weighs about 2 oz., without the small dry cell supplying the current, which may be attached to the head band or be carried in a pocket. It is found very useful in searching out engine troubles and making temporary repairs on the road after dark, as it leaves both hands free to do the work.

Working on the Engine under Illumination from the Head Lamp Leaves Both Hands Free for the Task

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The Fallacy of the Dirigible

By

VICTOR LOUGHEED

The finish of $400,000 expended by the British Navy on its great dirigible, which was dubbed "Mayfly" but which didn't.

THE lightest practical aeroplane capable of carrying a man weighs, with operator and enough fuel for flights of reasonable duration, about 1,000 lb. Such aircraft are sustained —as are the birds—by the complex but highly effective dynamic reactions of the air streams flowing under their wings.

The volume of 1,000 lb. of air is about 15,000 cu. ft.—the approximate contents of a sphere 30 ft. in diameter. By substituting for this volume of air something weighing less than 1,000 lb., the something weighing less will float statically in the air, just as anything weighing less than water, volume for volume, will float in water.

As a successful flying vehicle, the aeroplane is a development of no more than a very few years. Yet consistently since its advent it has evolved faster than any other device in the history of transportation. Its genuinely utilitarian applications are already considerable. Its applications to warfare are even now a proved success.

Yet the problem of the aeroplane is inherently complex.

The laws governing its action are exceedingly obscure. The limits of its efficiency are still unknown. Its best form is still undetermined. The difficulties of its equilibrium will still take much solving. And at every turn the aeroplane offers a field for investigation that seems as unlimited as it has proved fertile. While its structures are simple and cheap to build, their design is so baffling and involved, so demanding of the finest abilities of the best engineers, as to rank the problem of dynamic flight as one of the most difficult that modern science has to face.

The balloon as a means of travel is still of negligible utility, despite the numerous and long-continued efforts to make use of it in many fields. Without counterpart in nature, it has proved without justification in fact.

Yet the problem of the balloon is inherently simple.

The laws of its action are obvious. The limit of its lifting capacity is the easily ascertained weight of the air. The problems of its propulsion, steering, and navigation are inescapably definite. Yet, in the 50 years the dirigible has existed, it has not undergone a single fundamental change or improvement. Its changes have been changes in detail. Its improvements have been improvements in degree. Although tremendously expensive to build, and almost impossible to keep built, the problems of floating a balloon structure in the air are so inherently simple as to be easily understood by, and thus appeal to, the veriest tyros in mechanical science.

Automobile and aviation motor developments have advanced the speed of the dirigible from 7 to a present

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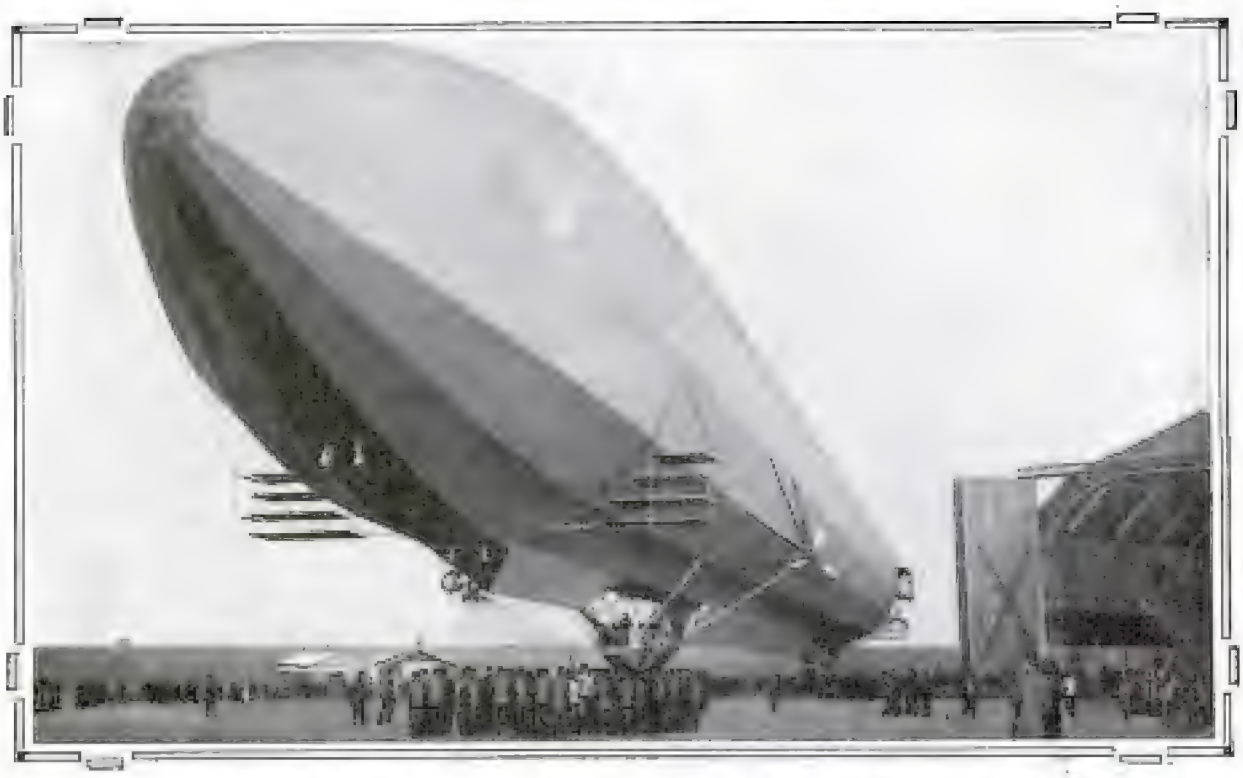

One of the most recent Zeppelin dirigibles. The size of these gigantic airships, which unquestionably are the best of their type, is well shown in this illustration and that on the opposite page. They average in cost not less than one-third of a million dollars each, and cost over $1,000 for a single filling of hydrogen gas.

maximum of some 30 miles an hour—nowhere enough to make headway against an ordinary adverse wind. Improved fabrics have enabled the dirigible to stay in the air the present maximum of 36 hours, without descending for gas. Similar slight improvements are the most that even its advocates are able to prophesy for the dirigible.

Yet on this much-punctured bubble of fabric-enveloped gas, it is conservatively estimated that there has been expended within the past 60 years—most of this within the latter decade of this period—not less than $50,000,000.

Never elsewhere in engineering history has so great an expenditure been made in a quest for practical results

The Wellman dirigible which attempted to cross the Atlantic in 1910, as it appeared drifting off to oblivion, after the crew had been rescued. The attempt reflected little or no credit on this type. Before it was abandoned it "performed" a thousand-mile drift at the mercy of the wind.

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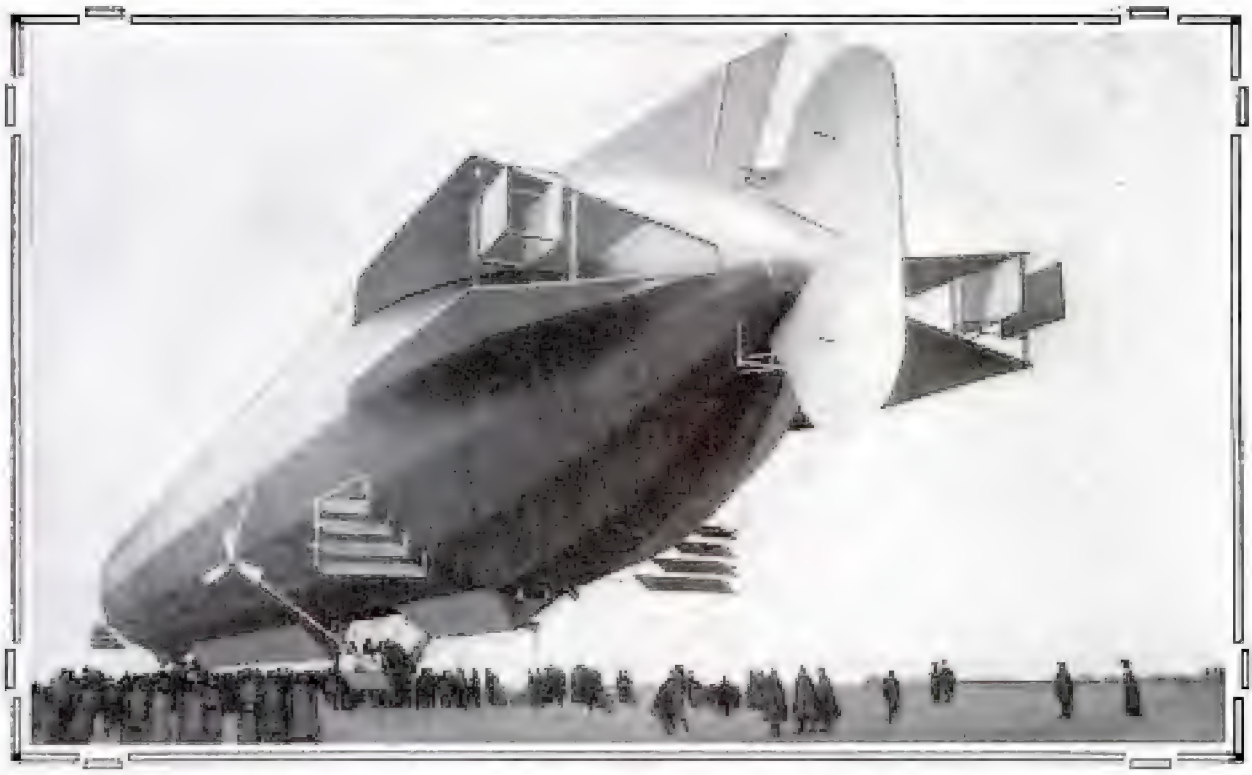

The Zeppelin dirigible has been developed at a total expenditure of not less than $5,000,000. It has inspired the comment, by a famous French authority on aero-navigation, that Germany "has freely and frankly confessed her mistake in pinning her faith to the illusive gas bag . . . by voting the sum of $7,500,000 for aeroplane manufacture."

that were in no measure realized. The pyramids may have cost the world more than the balloon, but a definitely practical result was not their object. Canals have been tremendous consumers of human labor, but canals serve their purpose. Immense sums have been spent in useless and unsuccessful invention, but it requires whole groups rather than single types of worthless devices to total such expenditures as the balloon has achieved.

Naval and military devices—battleships, weapons, armor, equipment, etc.—are tremendously costly, but these serve the utilities they are designed to serve, however much these types of utilities may be disparaged by peace advocates.

Experiments with dirigible balloons

The $250,000 Zeppelin dirigible, ruined beyond hope of salvage through being wrapped around a German hillside by a wind gust. Fortunately none of the passengers was seriously injured, but the slow speed of these clumsy and unwieldy giants renders them unable to drive into an opposing wind and thus escape such mishaps.

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within comparatively recent years have cost, in Germany, $6,300,000; in England, over $2,000,000; in the United States, $4,000,000; in France, $5,000,000; and in other countries of Europe and in Japan not less than $5,000,000 more.

These figures do not include the costly and long-continued experimentation during an earlier period of development, nor do they include the expenditures in non-dirigible ballooning, which has been made a costly hobby to which American and foreign millionaire sportsmen are even yet much addicted—apparently under the impression that they are furthering aeronautical research.

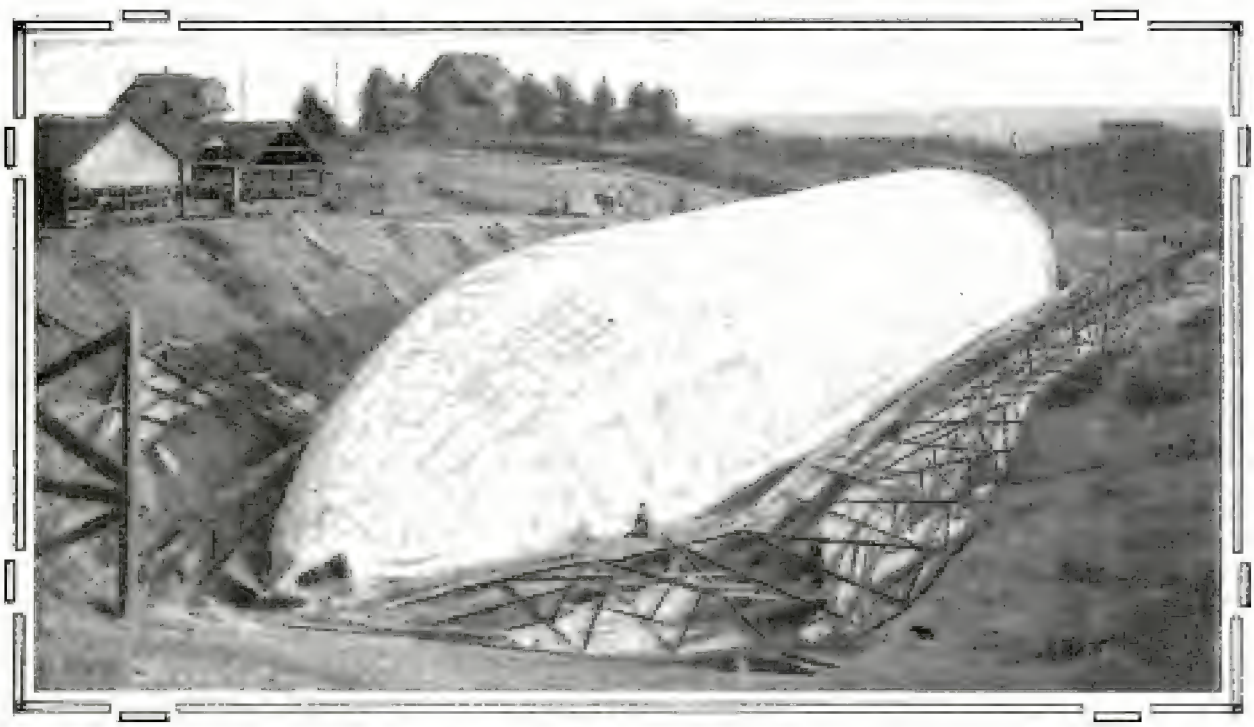
The problem of aerial navigation is fundamentally, as the term implies, a problem of *navigation*—of controlled and directed movement from place to place. Only in an incidental way is it a problem of sustention, and to solve the problem of sustention, difficult though it has proved, is not of itself a solution of the problem of navigating definite courses against adverse winds, at sufficient speeds to admit of practical and reasonably dependable travel.

Indeed, by no method of sound reasoning can the term flight be held to apply to mere uncontrolled sustention in and movement through the air—a feat that is variously accomplished by projectiles, skyrockets, objects adjacent to exploded dynamite, etc.

Condemned by this analogy, the various phenomena of balloon ascension, drifting, and dirigibility, however interesting they may be, are by no proper process of logic entitled even to classification with the phenomena of true flight—such as the controlled flight of birds and aeroplanes, faster than the average movement of the earth's atmosphere in the form of winds, such speed and control being absolutely essential prerequisites to any real navigation of the air.

Thus the balloon is an evasion rather than a solution of the real problems of aerial navigation. It floats in the air rather than navigates it, much as a soap bubble may float for a time, and, in reality, is no more a flying machine than a cork in the sea is an ocean liner.

As one authority, writing in a well-known flight magazine, said recently,



A recent fiasco in American dirigible building. This giant gas bag, which was built at San Diego, Cal., by a promoter with one previous failure of the same sort to his credit, proved not only unsuccessful in an engineering way, but also occasioned some curious legal complications, house dwellers in the neighborhood of the plant declaring the escaping gas to be a nuisance and a menace.

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"We have been experimenting with dirigibles for years, and . . . the sum total of success achieved is not a tithe of that attained in the case of the heavier-than-air type in as many months." Another European expert says that Germany "has to thank her dirigibles for her backward position in aviation, but . . . she has freely and frankly confessed her mistake in pinning her faith to the illusive gas bag."

The French army dirigible "Republique" in incipient collapse because of the deflation of the interior ballonets which maintain tautness of the envelope by having air pumped constantly into them.

The fact that numerous flights, so-called, have been made with dirigible balloons, and that many of these flights have been widely heralded as being practical instead of merely spectacular, is completely discounted by the further fact that the successes have been, without exception, achieved in almost perfectly calm weather. In all other cases the result has been complete failure to travel in the intended direction.

The circuitous thousand-mile drift of the recent "transatlantic" Wellman dirigible, over the Atlantic Ocean, is a typical case in point, and instead of being in any way to the credit of the dirigible, as a trip of that distance, constitutes as conclusive proof as could be sought of the completeness with which these gas bags are at the mercy of every wind that blows.

In the course of similar "balloonacy," as these perennial trans-oceanic fiascos have been classed, there is a remote possibility that some fortuitous combination of a good gas bag with a bad chance, may at last result in one of these exploits being crowned by a sufficiently long drift in the right direction—a contingency, however, rather more likely to be realized with a good motorless spherical balloon, several of which have already drifted across country to distances substantially equal to the narrowest dimension of the Atlantic Ocean. Then the problem of aerial navigation will be solved —in the daily newspapers.

Similarly, in the case of the great dirigibles of Count Zeppelin—which unquestionably are far in advance of other constructions of the same general character, and thus constitute a fair measure of the maximum practicability of the dirigible—the much-exploited and sensational "passenger-carrying" trips of these great balloons, in Germany, have not only been conducted in calm weather, but in addition to this have been attended by most frequent accidents and disasters in landing. Fortunately, these have happened to be without loss of life in most cases, but the property loss in the way of destruction to the giant aircraft has been prodigious. One expert has estimated that there is an

The ill-fated French military dirigible "Republique," which on September 25, 1909, was exploded at a height of 500 ft. by a broken propeller blade, with its consequent complete destruction and loss of the lives of the four French officers who were piloting it.

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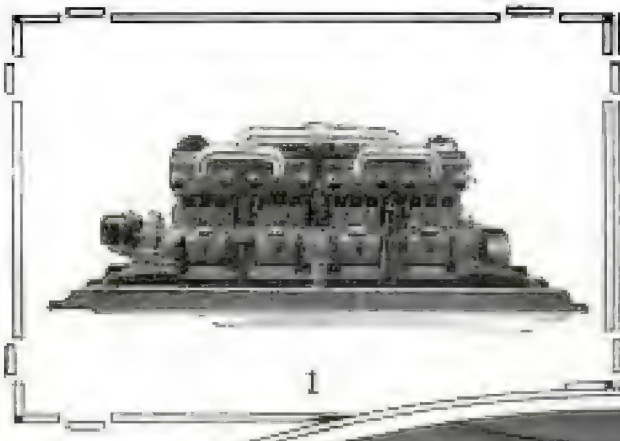

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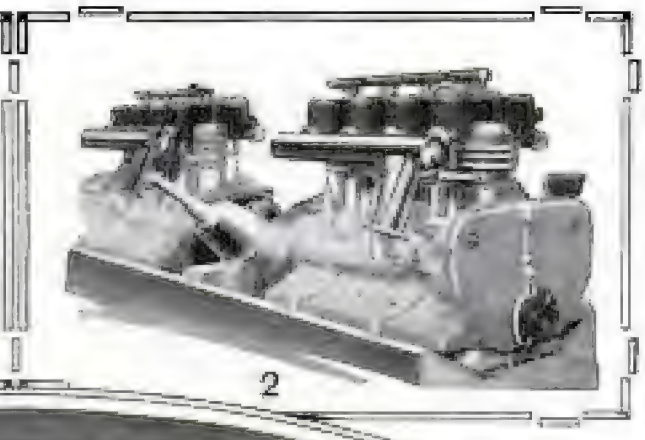

2

WHERE SOME OF THE MONEY GOES

The two engines shown—1 and 2—one of 100 hp. and the other of 280 hp., are of expensively made, light-weight types that cost $30,000 and $40,000 apiece to build.

3. Working on the envelope of a French balloon. This picture well shows the vast size of the modern dirigible, and suggests the amount of labor expended on what, after all, is one of the most simple and least expensive elements in the whole apparatus.

4. Another source of expense. A characteristic example of the type of balloon shed necessary for housing an army dirigible. Some of these sheds are as large and cost as much as a great modern world's-fair building or convention hall, and vast sums are expended for the labor required to set them up and dismantle them in the course of the military maneuvers of the European armies.

average of $10,000 of damage done to the Zeppelin balloons in each three out of every five of the landings they make.

The effect of size on balloon design is a subject that has been befuddled with much misunderstanding. The common assertion that doubling the dimensions of a balloon cubes its capacity, while only squaring the areas of the surfaces, is, of course, true. But it does not follow from this that the lifting capacity increases faster than the weight with increase in size, for to maintain a proportionate strength it is necessary to increase the thickness of the surface material and the weight of the internal bracing, with each added increment of size.

Insuperable objections to the balloon are its inescapably enormous volume and its consequent strict limitation in weight of structure. To ascend, a balloon must be lighter than the volume of air it displaces. And, the weight of a given volume of air being fixed, there is no possible discovery or invention that can open a way of es-

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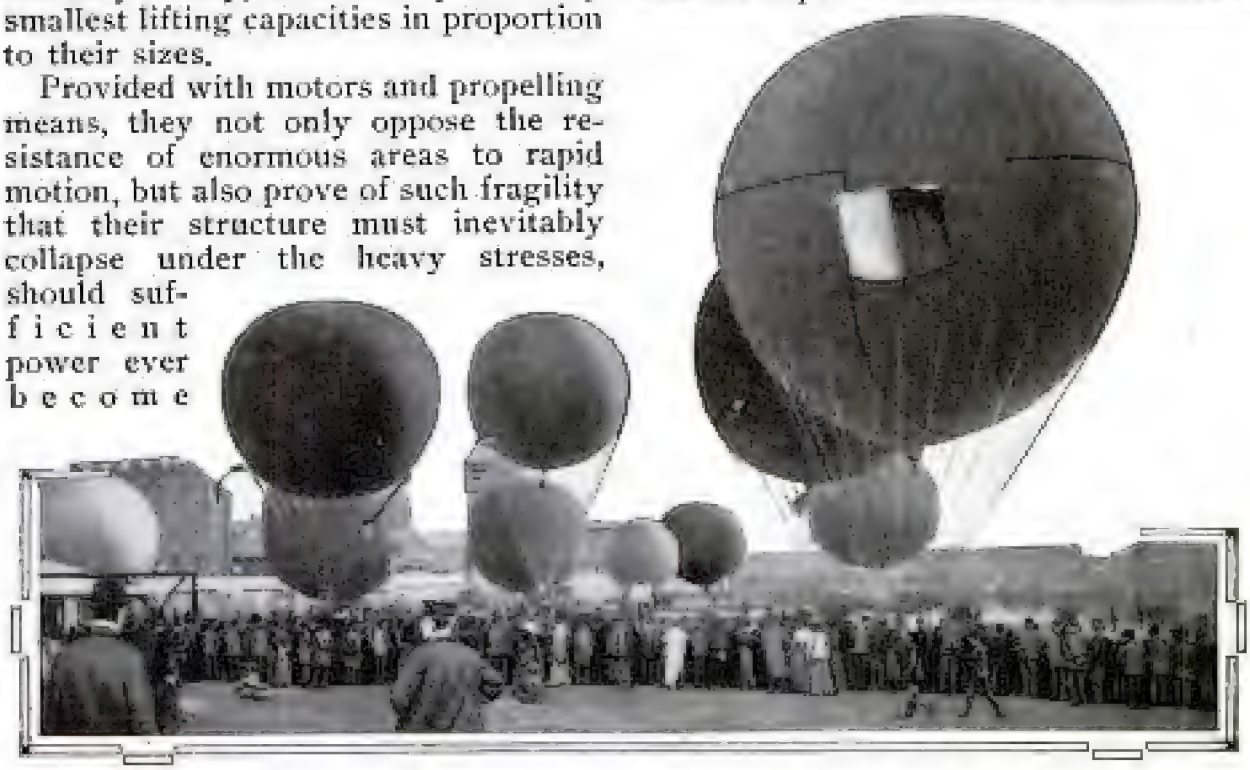
cape from this inexorable factor of the problem. The only substances that even approach air in lightness being also gases, the design of no conceivable lighter-than-air machine can escape the necessity for two essential elements—space occupied by a gas lighter than air, and a stout envelope of heavier-than-air material to contain the gas. To the weight of these primary essentials must be added the further weight of structure necessary to afford passenger or cargo accommodation.

Since a sphere of air 30 ft. in diameter weighs about 1,000 lb., while a similar sphere of hydrogen, the lightest known gas, weighs only 70 lb., it is evident that the unlikely discovery of a gas lighter than hydrogen can be of no great benefit, for even should it become feasible to encase a vacuum of the requisite size, as some enthusiasts have hoped, this could add to the sustention only to the extent of the eliminated 70 lb. of hydrogen. From all of which it follows that the best of balloons must be hopelessly bulky and fearfully flimsy, and of only the very smallest lifting capacities in proportion to their sizes.

Provided with motors and propelling means, they not only oppose the resistance of enormous areas to rapid motion, but also prove of such fragility that their structure must inevitably collapse under the heavy stresses, should sufficient power ever become available—as is not unlikely—to drive them greatly faster than their present maximums of 25 or 30 miles an hour.

In this connection, however, another comparison between the balloon and the aeroplane, relating to the matter of power, is most interesting. An average aeroplane, weighing 1,000 lb., will oppose not more than 25 sq. ft. of projected area to its movement through the air. A balloon of similar lifting capacity, if made spherical, will oppose over 700 sq. ft. to movement through the air—28 times as much area as the aeroplane of the same weight.

Even by compacting this necessary bulk into the most approved elongated dirigible form, the cross-sectional area cannot be reduced below a minimum that is still at least six or seven times as great as the area of the equivalent aeroplane. And, since it is area opposed to movement through the air that measures the quantity of horsepower required, it follows that to propel a dirigible against the minimum resistances of its cross section, must forever require much greater power than is required for both the sustention



The fad aspect of ballooning. The start of a recent Gordon-Bennett balloon race. In this sport it has become quite the fashion for millionaires to engage, under the impression that they are furthering the cause of aviation, though, as a matter of fact, their expenditure of several thousand dollars each for spherical balloons, and subsequent cross-country drifting with whatever winds may blow, bears about as little relation to aero-navigation as drifting on a raft would to crossing the ocean in a modern liner.

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and propulsion of an aeroplane of equivalent loading.

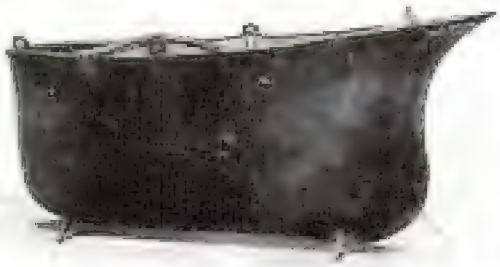
Incidentally, it is to be remarked that all changes from a spherical form, as in realizing or approximating the elongated form of the dirigible, involve special means for staying the structure, in addition to which they add greatly to the area of the envelope required for a given volume of gas enclosed. The problem of weight and structural security are thus greatly complicated.

The original balloon. An exact copy, shown at a recent French exposition, of the original Montgolfier balloon, which was sent up from Annonay, France, without passengers, on June 5, 1783. Since 1784, in which year all of the essential details of the balloon were devised—coated-silk fabric, gas valve in the top, sand ballast, the rip cord, netting-supported basket, etc.—there has been no development of fundamental importance.

The most elementary type of balloon is the spherical balloon, designed for mere ascension and flotation in the air, with no attempt at navigation in a lateral direction except as such movement may result from wind.

The invention of the spherical balloon, according to some authorities, is properly to be credited to the Chinese, who, according to the writings of a French missionary, sent up a balloon in celebration of the coronation of a Chinese emperor, in 1306 A. D.

The first European appreciation of the principle by which a balloon is made to ascend appears to have been due to a Jesuit, Francis Lana, who in 1670 proposed an airship sustained by four hollow copper vacuum balls, each 25 ft. in diameter. In 1776, Dr. Black, of Edinburgh, made a small balloon that proved to be too heavy for sustention by the hydrogen it contained, but a few years later Tiberius Cavallo succeeded in inflating soap bubbles with hydrogen, with the result that they floated upward until they burst.



The first attempt at a dirigible. The car of the balloon used by Blanchard and Jeffries, in their crossing of the English Channel on January 7, 1785, in a favoring wind. It was attempted to propel this balloon by the use of large fan-like oars but this expedient naturally proved a complete failure, and the wind became the sole mean of propulsion.

The balloon that is commonly credited with being the first was invented by Stephen and Joseph Montgolfier, and sent up from Annonay, France, on June 5, 1783. This balloon was of paper, about 30 ft. in diameter, and was inflated with heated air, affording an ascensional force of probably 500 lb.

Soon after, on August 27, 1783, a hydrogen balloon was sent up from Paris. On September 19, 1783, the brothers Montgolfier sent up a balloon to which a small car was attached, in which were placed a sheep, a cock, and a duck, which thus had thrust upon them the distinction of being the first balloonists. The descent occurred eight minutes after the start, and the sheep and duck were uninjured. The cock had not fared so well and his condition was gravely attributed by the scientists present to the effects of the thin atmosphere of the upper regions. More recent diagnosis, however, has suggested that he was trampled upon by the sheep.

The first ascent of a man-carrying balloon was ventured by Pilatre de Rozier, who went up to a very moderate height in a captive balloon, built by the Montgolfiers, on October 15, 1783. Following this, on November 21, 1783, de Rozier and the Marquis d'Arlandes made the first free-balloon ascension,

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from Paris, accomplishing a safe descent in a field 5 miles away after about 20 minutes of drifting, at a height of 500 ft.

Since the foregoing, thousands of other balloon ascensions have been made all the world over. In the course of these, some utility has developed in the way of military and meteorological observations, but the early and unavailing attempts to navigate definite courses from one point to another, either in calm weather or independent of the direction of the wind, have not been materially improved upon by the most recent efforts, aided by every resource of modern engineering. Indeed, as one wag has put it, the sole result has been the division of balloons into two classes, "non-dirigibles and near-dirigibles."

The first obvious line of improvement in the quest for dirigibility was the reduction of the head resistances, as has been already explained. This is the ideal held in view in the many cylindrical, cigar-shaped, and other elongated and pointed gas bags with which the modern student of this subject is familiar.

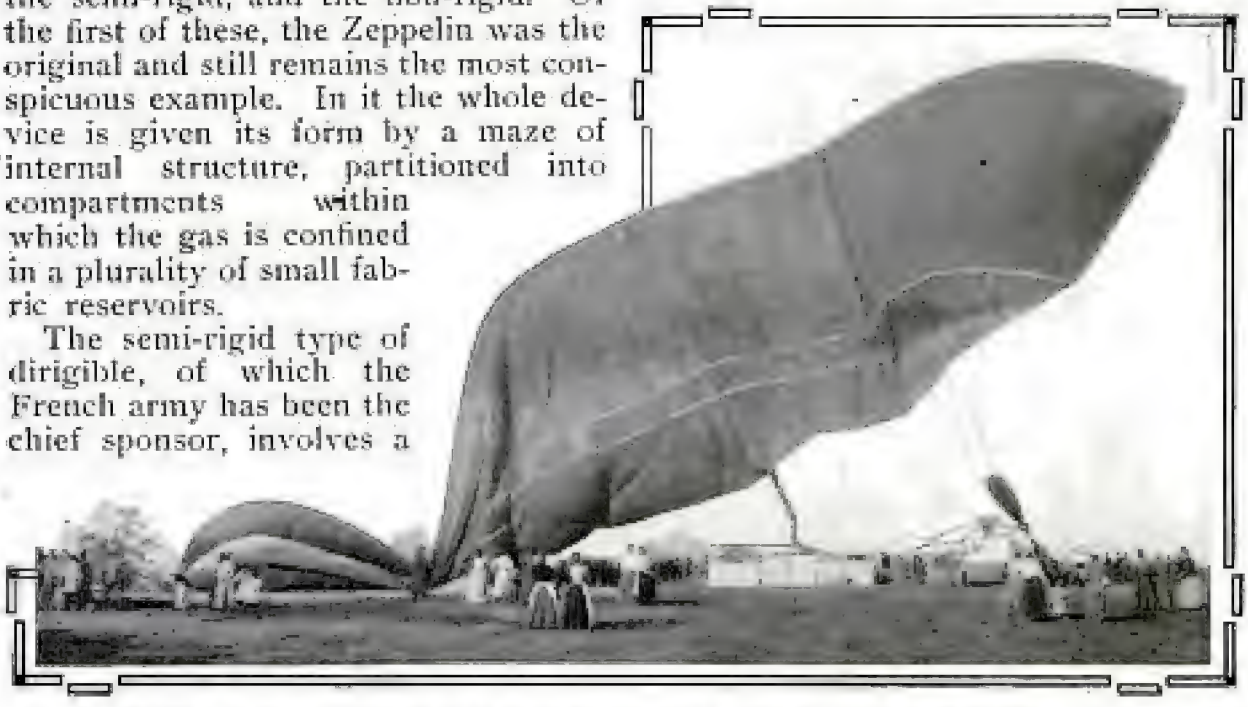
Dirigible balloons have been developed in three principal types—the rigid, the semi-rigid, and the non-rigid. Of the first of these, the Zeppelin was the original and still remains the most conspicuous example. In it the whole device is given its form by a maze of internal structure, partitioned into compartments within which the gas is confined in a plurality of small fabric reservoirs.

The semi-rigid type of dirigible, of which the French army has been the chief sponsor, involves a pointed gas bag, not internally braced, and kept in shape by being stayed by netting and numerous ropes to a long truss-like girder beneath it.

The wreckage in the Seine of the gigantic military dirigible recently built by the Clement-Bayard concern in France. This accident, like many other dirigible accidents, occurred without loss of life but with tremendous destruction of valuable property.

The non-rigid balloon is simply a bag kept in shape by its form and the pressure of the gas within it, so it is naturally subject to all sorts of failures to maintain its proper form.

A particular example of the sorry



The dirigible "Espana," showing the destructive results of a modern landing. A dirigible of this type costs about $100,000.

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and expensive experiences various governments have had with the dirigible-balloon problem is the German government's recent dismissal of the Zeppelin proposition in favor of the aeroplane, for which an army appropriation of some $5,000,000 has been made for the coming year.

Another case is that of the English navy dirigible, aptly dubbed "Mayfly," which recently broke in two and capsized at a total loss of $400,000, the first time it was taken out of the floating shed that housed it.

Further condemnation of the dirigible is found in the fact that most of the ablest engineers who have given attention to its problems—Santos Dumont, Renard, and Ferber, for conspicuous examples—and who have expended vast sums upon its development, with resulting successes that will rank with any, have finally deserted the balloon as hopeless, and turned their attention to the aeroplane.

In the matter of propulsion, experiments commenced with the hand-manipulated cars and sails of early investigators and developed down to the engines and propellers of modern dirigibles. So far, however, all successes achieved with dirigible balloons have been more spectacular than practical, and despite the roseate imaginings of popular writers, there is little technical reason for expecting that results of more serious value are in any prospect of attainment.

Even admitting the possibility of an exceedingly limited and precarious utility for the dirigible in warfare, in the opinion of those best qualified to judge, it is most unlikely ever to assume the least importance as a means of travel, and can have no future beyond such as is too often founded upon the activities of ignorant inventors or unscrupulous promoters, or upon the thrills a great dirigible undoubtedly affords as a Gargantuan spectacle.

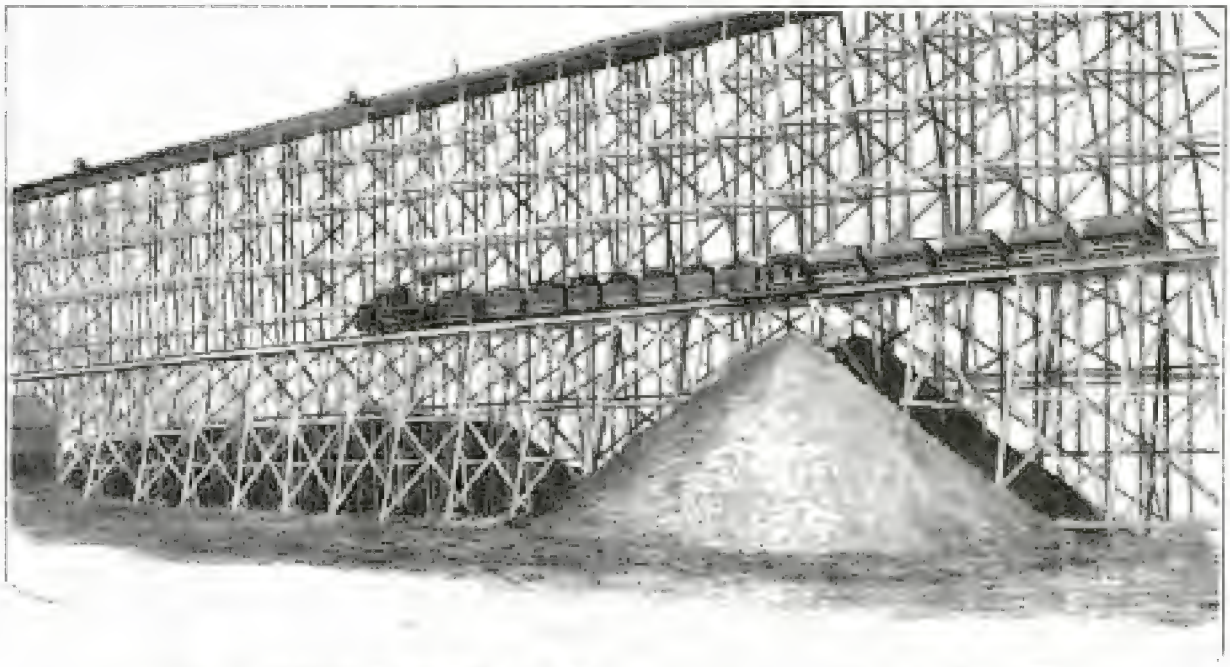
The cost of gas for each filling of a large balloon is alone enough to place it out of the question for performing commercial travel at reasonable cost. Not less than a thousand dollars worth of hydrogen on the basis of the most economical production possible, is required for each inflation of a Zeppelin balloon, which, though 450 ft. long and nearly 50 ft. in diameter, possesses a reserve carrying capacity of only three or four tons. Moreover, with a century of experimenting, no balloon builder as yet has been able to improve materially upon the first envelopes of varnished silk—which still remains the most impermeable material—and at the present time no dirigible balloon has ever succeeded in staying in the air for more than 36 hours.

The conclusion is inevitable, from any competent and unbiased consideration of both the shortcomings and the merits of the balloon, that it can never really compete with the aeroplane as a practical means of traveling in the air. Mere going up in the air is another matter, but for the uses that can be thus served the simpler and cheaper spherical balloon would appear to be in every way superior to the expensive and practically no more useful dirigible.

When it comes to real navigation of the air, to fast, certain, and absolutely controlled travel in any desired direction, nature's model, the bird, is proved by every test of logic and experience to be the only safe pattern for man to follow.

EXCEPTIONALLY LARGE TRESTLE FILL

An exceptionally large undertaking in railroad-trestle filling is in progress at Sprague Gulch, near Lamont, Wash., on the Spokane, Portland & Seattle Railroad. The wooden trestle across this gulch, built in 1907, is 4,869 ft. long, with a maximum height from base of rail to surface of water of 101 ft., and an average height of over 75 ft. In planning for the necessary reconstruction of this trestle, it was found that it could be filled at no



At Work on First Lift, in Filling the Railroad Trestle across Sprague Gulch, Wash.

greater cost than that of building a steel viaduct and the work was started in 1911.

The illustration shows a dirt train being dumped on the first lift, a working trestle being erected close to the main trestle. Working trestles were constructed for the first and second lifts, but in the third lift the contractor will change to standard-gauge equipment and unload from the main line, working under control of the regular railway train dispatcher. The total estimated amount of earth to be handled is 2,350,000 cu. yd.

JOINT MEETING OF CLUBS SEVENTY MILES APART

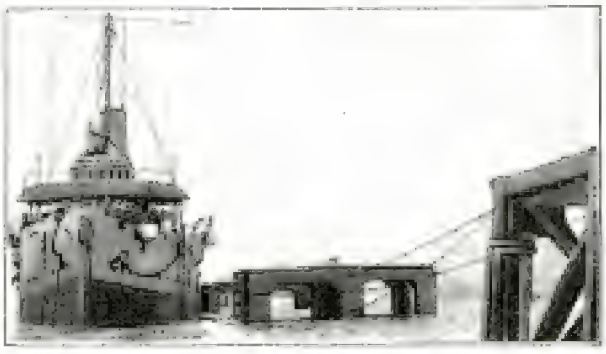
A feat that is said to be without a precedent, was the bringing together of two club meetings, 70 miles apart, so that members of each club could hear every word spoken at the other, recently accomplished by the Buffalo and Rochester (N. Y.) Advertising Men's Clubs.

Each club arranged a meeting to be held at its respective city the same afternoon, and as each guest sat down to luncheon he was equipped with a receiver, like those used by telephone operators, and by the aid of a large transmitter at the end of each room, everything that was spoken in either club could be heard by the guests in both cities.

A feature of the affair was that the members of the Rochester Advertising Men's Club sang to the music of the orchestra in Buffalo.

MOORING DOLPHINS IN PORTSMOUTH HARBOR

The rapid increase in the number of warships that have to be berthed in Portsmouth Harbor, which is Great Britain's chief naval base, has compelled the Admiralty to construct new mooring means. Four concrete dolphins, to which warships and other vessels can be moored, have already been built.



A British Warship Berthed by the Concrete Mooring Dolphins Recently Built in Portsmouth Harbor, Which is England's Chief Naval Base

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SCIENCE AND MECHANICS HELP MAKE DURBAR

The Royal Palace of Great Britain for the Time Being. Tents Occupied by George V and His Suite at Delhi. The Tents were Lavishly Decorated and Divided into a Number of Large Apartments

The King-Emperor's Work Room in His Delhi Tent-Palace

Their Majesties Showing Themselves to Their Subjects

The most gorgeous spectacle in the history of the world is not a fulsome phrase when applied to a description of the Durbar at Delhi when George V personally received the homage of the people of his Indian empire. Though the ceremony was of an ancient character it was carried out with the aid of the most modern mechanical and scientific appliances, electricity being employed to produce all sorts of

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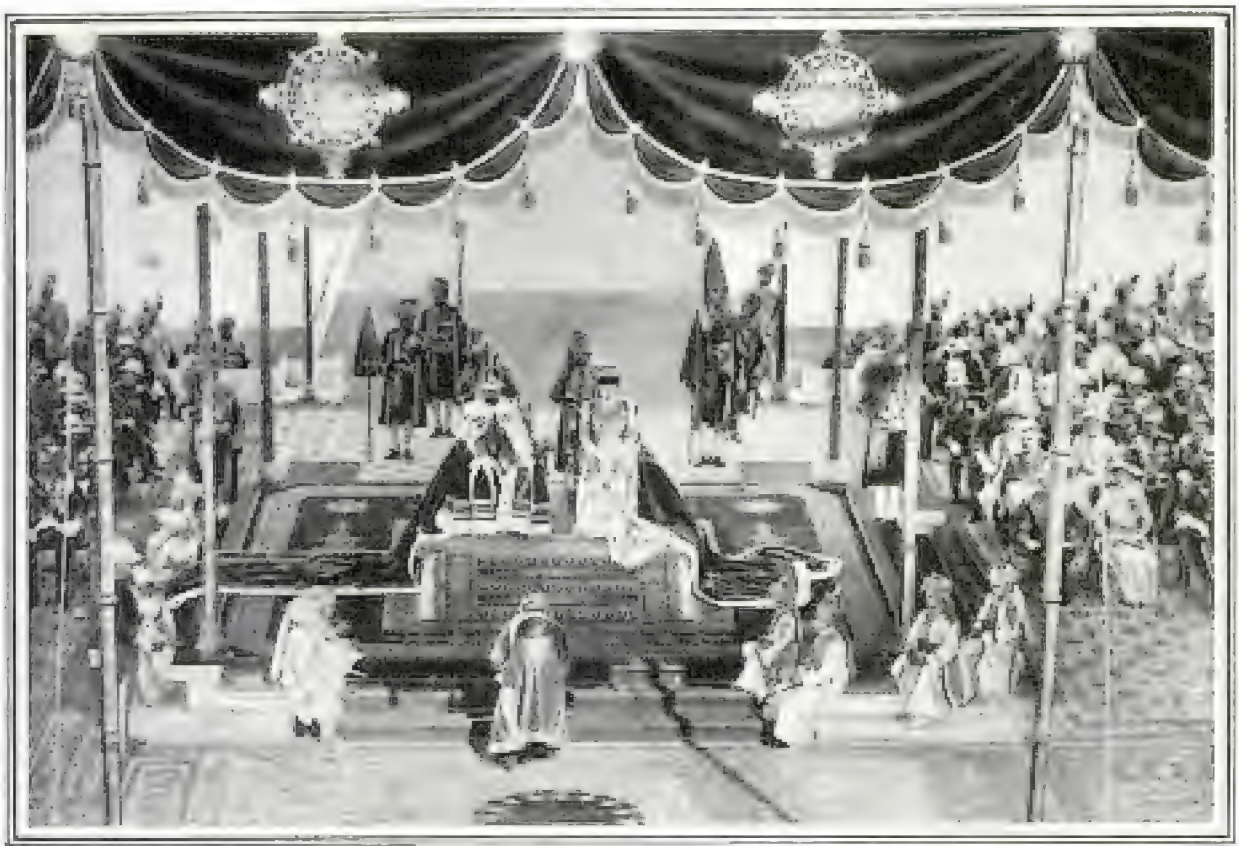
MOST SPECTACULAR OF MODERN CEREMONIALS



Princes and Potentates of the Indian States Paying Formal Homage to George V and His Queen during the Durbar Ceremonies

State Entry to Delhi through the Ancient King's Gate

brilliant lighting effects as well as to insure the comfort of their majesties in the tented city where they made their homes during their stay at Delhi. The permanent record of the festival to be filed in the government archives will include a complete set of moving pictures of the various ceremonies as well as a written narrative. The festivities cost the government millions of dollars.

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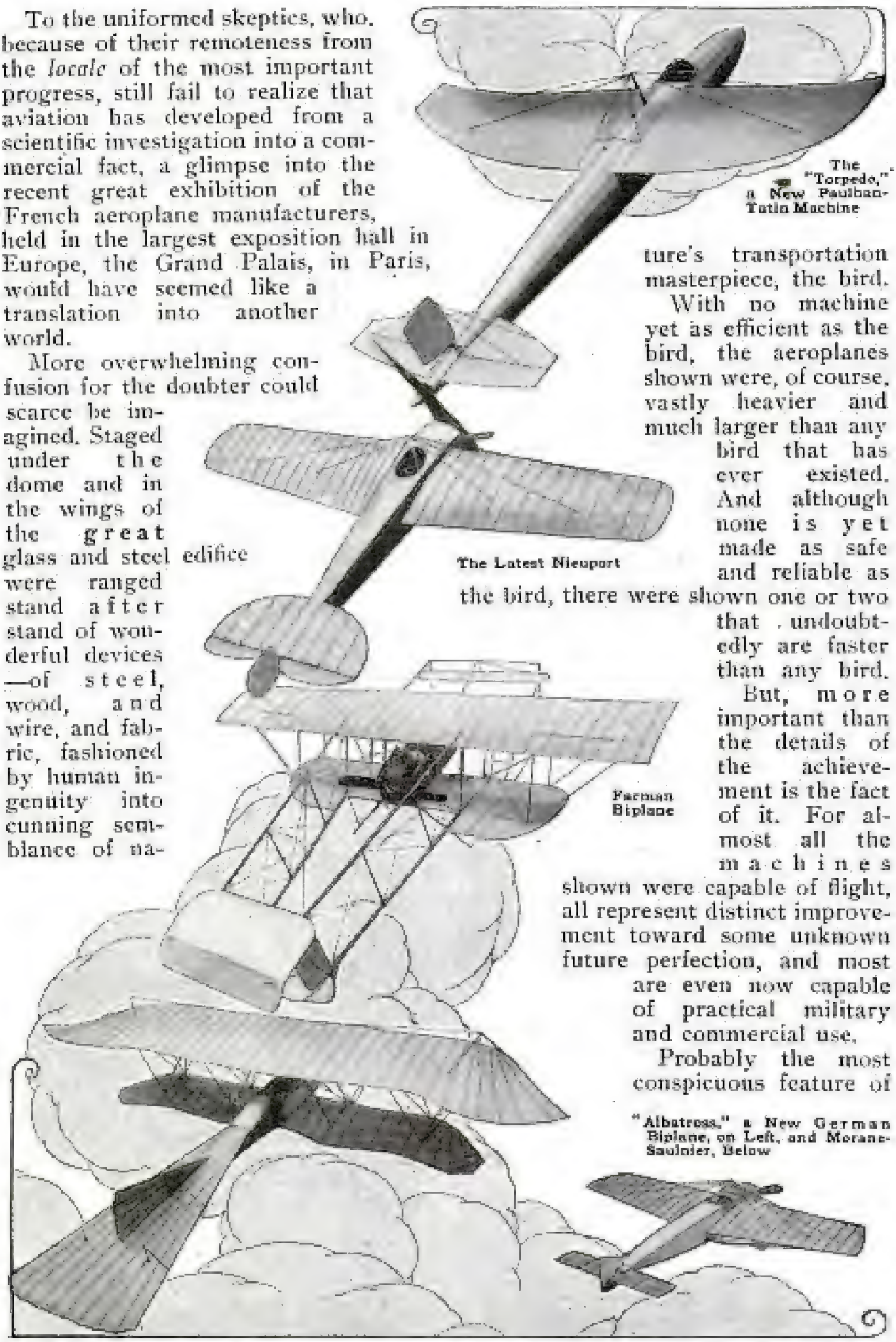
STREAMLINE FORMS APPEAR AT PARIS EXHIBIT

To the uniformed skeptics, who, because of their remoteness from the *locale* of the most important progress, still fail to realize that aviation has developed from a scientific investigation into a commercial fact, a glimpse into the recent great exhibition of the French aeroplane manufacturers, held in the largest exposition hall in Europe, the Grand Palais, in Paris, would have seemed like a translation into another world.

More overwhelming confusion for the doubter could scarce be imagined. Staged under the dome and in the wings of the great glass and steel edifice were ranged stand after stand of wonderful devices—of steel, wood, and wire, and fabric, fashioned by human ingenuity into cunning semblance of nature's transportation masterpiece, the bird.



The "Torpedo," a New Paulhan-Tatin Machine

The Latest Nieuport

Farman Biplane

"Albatross," a New German Biplane, on Left, and Morane-Saulnier, Below

With no machine yet as efficient as the bird, the aeroplanes shown were, of course, vastly heavier and much larger than any bird that has ever existed. And although none is yet made as safe and reliable as the bird, there were shown one or two that undoubtedly are faster than any bird.

But, more important than the details of the achievement is the fact of it. For almost all the machines shown were capable of flight, all represent distinct improvement toward some unknown future perfection, and most are even now capable of practical military and commercial use.

Probably the most conspicuous feature of

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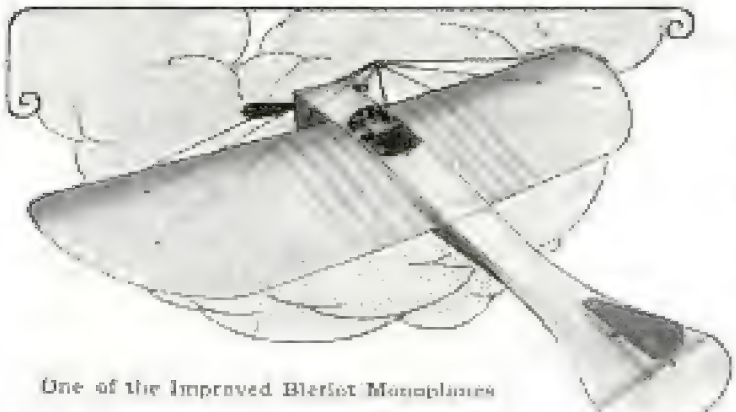
UNIQUE VIEWS OF SOME ADVANCED TYPES SHOWN



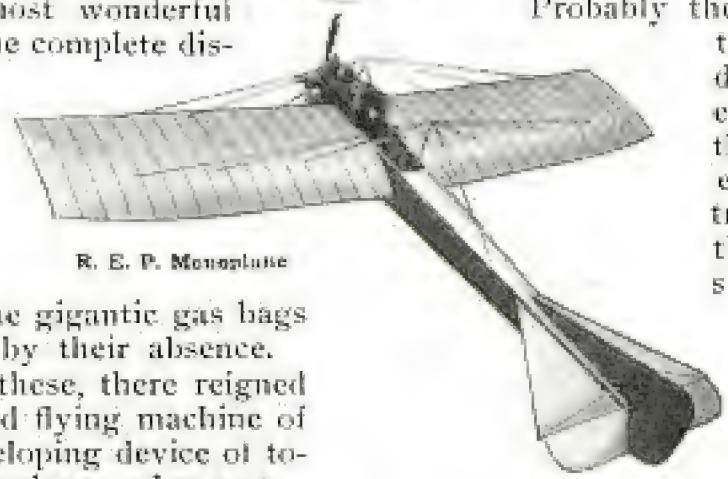
One of the Improved Blériot Monoplanes

this latest and most wonderful aviation show is the complete disappearance of the freak and the almost total neglect of the dirigible. The helicopters and ornithopters of other years, and the gigantic gas bags were conspicuous by their absence.

In the place of these, there reigned supreme the proved flying machine of today and the developing device of tomorrow—the aeroplane—almost every model in the building being the creation of a far-seeing, technically able, and well-financed concern, seriously and sucessfully engaged in the commercial exploitation of a new field of engineering, in which great successes have been achieved and in which greater are coming.

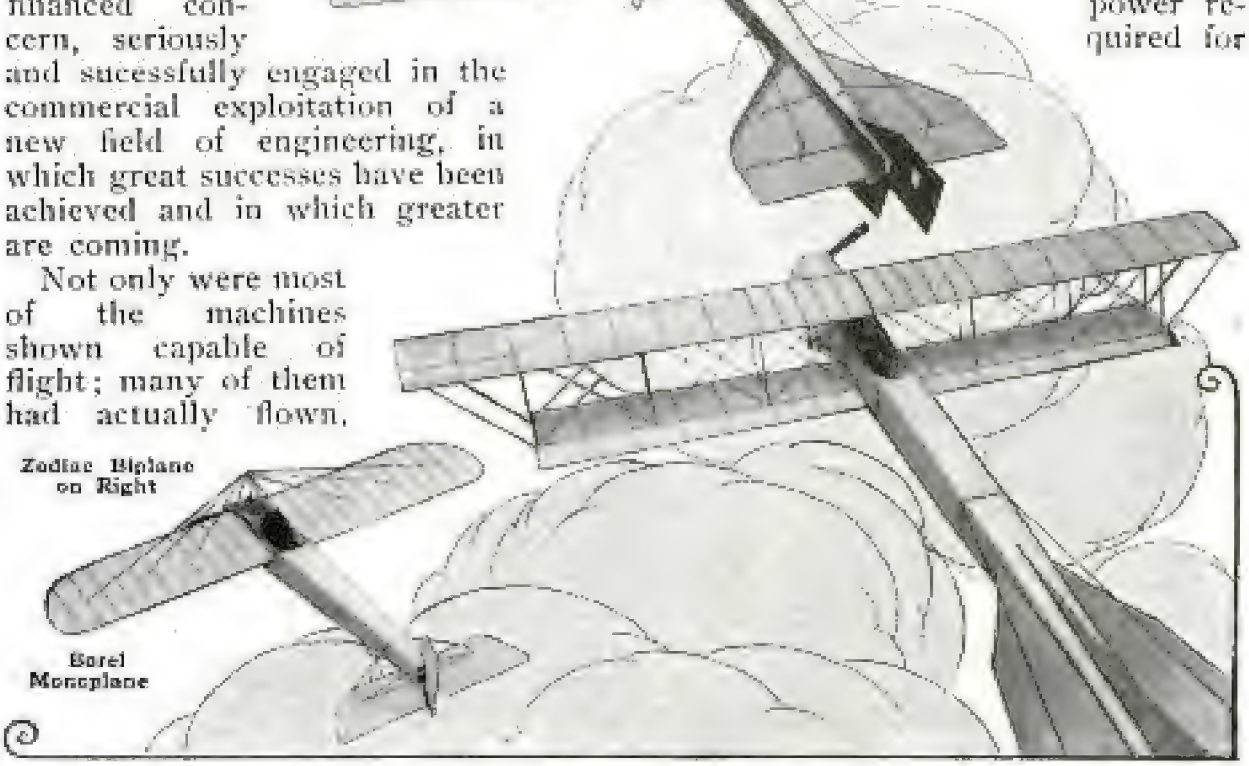
Not only were most of the machines shown capable of flight; many of them had actually flown, and unfailing centers of interest were the battered and weathered monoplanes and biplanes, which, in contrast with the surrounding newness of clean fabric, varnished wood, and bright metal, bore placards testifying to wonderful cross-country, altitude, and speed flights, performed in the course of various military and other European competitions.

Probably the most important technical development in evidence was the thoroughly emphasized trend toward the use of streamline forms, as means of reducing the forward resistances of the aeroplane, and therefore the amount of power required for



R. E. P. Monoplane

Deperdussin



Zodiac Biplane on Right

Borel Monoplane

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its propulsion. As suggested in the articles in the December and January issues of Popular Mechanics Magazine, the inherent advantages of the streamline form are so astounding that, as they commence to be appreciated, it is not to be wondered at that there is a stampede towards their realization.

At the French show, however, it was to be noticed that the streamline form has been applied so far chiefly to bodies, despite the fact that its application to wings and other elements is of almost equal importance—in progressing towards the ultimate quality that will rank the man-bird with nature in the important respect of efficiency.

Another important development is the increasing use of metal in place of wood, steel tubing in the alighting gears of the monoplanes, and in the struts and wing bars of the biplane being very common. Less general, but more interesting, are the examples of steel construction applied to body designs and wing elements.

The question of biplane vs. monoplane still remains unsettled, but there is a definite tendency, particularly on the part of the most important manufacturers, to favor the single-surfaced craft. Emphasizing this tendency is a not uncommon disposition on the part of the biplane builders, to lengthen the upper surface very greatly, at the same time so reducing the lower surface that it constitutes little more than a sort of extended underbracing and under member of the fuselage, useful chiefly as a structural element between the alighting gear and the upper surface, and of only incidental use in its contribution to sustention.

In the way of motors, there are several new revolving motors to compete with the well-known make of this design that has contributed so much to the development of aviation, but the generality of manufacturers seem inclined to pin their faith to the more conservative, heavier, and more conventional engines, adapted from automobile practice, and therefore reasonably capable of more sustained use without stopping or overhauling.

CAPTURED BATTLE FLAGS MAY BE EXHIBITED

Students of American history, more especially those interested in the navy, are giving much attention to the disposition of the collection of captured battle flags and trophies now slowly decaying in iron chests in the chapel of the Naval Academy at Annapolis. It has been proposed to place these trophies on exhibition by hanging them in the chapel, after the manner of the display of such things in European cathedrals and battle abbeys. It will be necessary to make elaborate repairs of many of the flags, however, and to do this Congress has been asked to appropriate $30,000 to bear the expense of the delicate operations necessary. The repairs will constitute a complete restoration of the flags, so far as texture is concerned, by reinforcing them with a fine and almost invisible linen mesh. It has been estimated that 1,200 yd. of this mesh will be needed for the work, as there are 150 ensigns and pennants in the collection. The material for the work will cost $1,500 and the work itself will consist of a series of long, tedious and delicate operations which can only be performed by the most skilled needlewomen.

The trophies include a number of the most interesting relics of American naval warfare. To naval men the most important of them all is the flag of Commodore Perry, which, during the battle of Lake Erie, he carried from his sinking flagship, "Lawrence," to the "Niagara," on which he won the battle. This faded and tattered ensign bears the dying message of Captain Lawrence to his officers, a phrase which has become the motto of the American navy—"Don't Give Up The Ship." The immortal words were uttered during the engagement between the American ship "Chesapeake" and the British vessel "Shannon," June 1, 1813. Lawrence, the commander of the "Chesapeake," fell mortally wounded and with his last breath commanded his successor not to give up the ship. It was for this that Perry's flagship was

TREASURED TROPHIES OF NAVAL PROWESS

Jack of the British Ship "Guerriere," Captured by Commodore Isaac Hull, Commanding the "Constitution"

Ensign of the Confederate Ironclad "Albemarle," Captured by Lieut. W. B. Cushing, U. S. N., Oct. 27, 1864

Personal Ensign of Admiral Cervera of the Spanish Navy, Captured July 3, 1898, at Santiago, Cuba

Flag of British Ship "Macedonian" Captured by Commodore Decatur, Commanding "United States," Oct. 25, 1812

The Battle Flag of Perry at the Battle of Lake Erie Bearing Lawrence's Dying Words, Now the Motto of the American Navy—"Don't Give Up the Ship"

The Only British Royal Standard Ever Captured by any Nation. Taken by American Troops at the Capture of York (now Toronto), Canada, April 27, 1813

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named the "Lawrence" and his battle flag was a large ensign bearing the never-to-be-forgotten words.

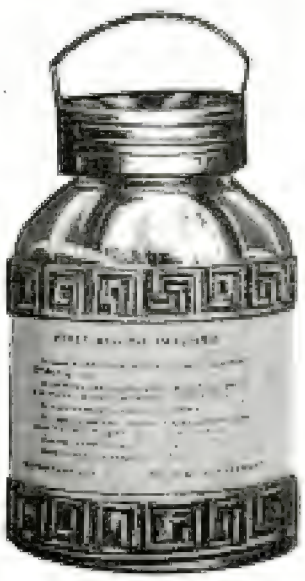
Another interesting relic is the only British royal standard ever captured in battle by any nation. This fell into the hands of the Americans at the capture of the Canadian city of York, April 27, 1813. York is the former name of the city now known as Toronto. Still another trophy is a relic of the battle between the "Constitution" and the "Guerriere," August 19, 1812, and is no less than the flag of the British ship which was captured by Commodore Hull, the American commander. The deeds of Commodore Stephen Decatur are commemorated in a dozen or more trophies of various kinds, one of the most interesting being the ensign of the British ship "Macedonian" captured by him, October 25, 1812, while in command of the frigate "United States."

The flag of the Confederate ship "Albemarle," captured by Lieut. W. B. Cushing, Oct. 27, 1864, which is in the collection, is of more than passing interest because it is not only a trophy captured during a most daring exploit, but also commemorates the first successful use of a torpedo boat. Cushing was the originator of the use of torpedoes fired from special craft, and in this instance he penetrated the enemy's lines in a small boat, to a boom on which was attached a torpedo. He ran his little craft alongside the "Albemarle," launched his boom-torpedo and exploded it, destroying the enemy's ship.

One of the newest and best preserved of all the flags is the personal pennant of Admiral Cervera of the Spanish navy, captured at the battle of Santiago. There are numerous other flags in the collection, each of which has an interesting history.

FIRST-AID-TO-INJURED PACKAGES IN JARS

In a large factory at Worcester, Mass., having a well equipped medical department to care for injured or unhealthy employes, the articles required for first aid are kept in air-tight glass jars. Each jar contains three bandages of different widths, one package of gauze pads, three finger splints, one rubber tourniquet, one measuring glass and a bottle of aromatic spirits of ammonia. Labels containing general directions for use are pasted on the outside of each jar, and a card of first-aid instruction is posted in each department. Every foreman in the factory is provided with a jar, and is given special instruction. Once a week all the foremen are called together and given a 30-minute lecture upon treatment of victims of accidents which occur most frequently. These lectures are illustrated by blackboard and practical demonstrations, such as putting on bandages, splints, etc.



EAR-PHONES FOR THE DEAF

A device, designed to improve the hearing of the deaf, recently shown before the French Academy of Sciences, is of particular interest because of its diminutive size. It comprises a microphone transmitter and receiver joined by a tube, and is so small that the whole can be easily introduced into the auditory canal of the ear and be worn there without discomfort. Two sets are provided, one for each ear, and the necessary electric current is supplied by a dry cell, which may be carried in a vest pocket.

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"PULMOTOR" SAVES SEVEN LIVES IN CHICAGO

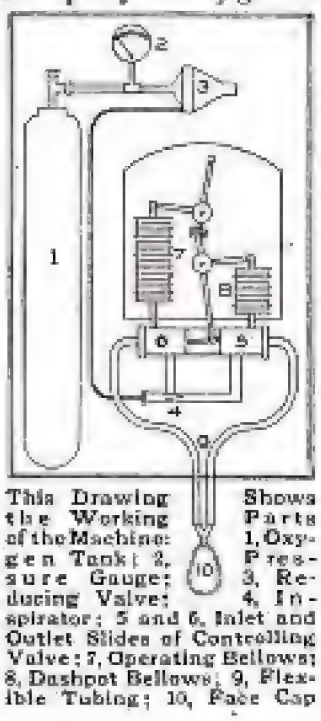
A German resuscitation machine, called the "pulmotor" because it is designed to induce pulmonary action shortly after breathing has been stopped by unnatural interference, was recently added to the emergency equipment of the Commonwealth Edison Company of Chicago. It was the first of these machines brought to Chicago, but it will not be the last, for in the month of January alone it was successfully used in resuscitating seven persons who were apparently dead from gas asphyxiation.

The first test given the machine was in the case of a retired lawyer, 65 years old, who was found apparently lifeless from asphyxiation in his home. In less than half an hour he was restored to consciousness. The success of the first local test of the machine resulted in an offer of the Commonwealth Edison Company to allow the city the free use of the machine. This offer was accepted, and a few days later two women and a little girl, overcome by gas escaping from a gas range and apparently beyond hope of recovery, were all saved from death. A week later it was called into service again, and this time saved the lives of a man, woman, and child found unconscious by a policeman who was attracted to their home by the fumes of escaping gas.

The remarkable success of the "pulmotor" in Chicago, however, is not the first demonstration in America of its efficiency. It has also been used successfully in the East, and a number of the machines were required last year by the government for use in connection with the mine-rescue service. Several months ago it was described in this magazine in connection with mine-rescue work, but its late successes warrant a further and more detailed description.

The "Pulmotor" in Operation, Causing Mechanical Respiration Which is a Perfect Imitation of Natural Breathing

The apparatus is carried in a case as easily handled as an ordinary dress-suit case. The tank, which is an iron cylinder, 21 in. long by 3½ in. in diameter, contains oxygen at a pressure of about 2,800 lb. when completely filled. This gas, which is life-sustaining when taken into the lungs, also furnishes the energy required to reproduce the action of natural breathing. The oxygen flows first through a reducing valve, which maintains at the outlet a pressure of about 75 lb., and from there to the controlling valve. This controlling valve, which is connected to the metallic face cap by means of rubber tubes, provides, initially, a free passage to the lungs, but when the pressure of oxygen in the lungs reaches a certain value, about normal, a bellows, interconnected with the lung cavity through the rubber tubes, actuates the controlling valve in a manner that reverses the action. That is, the pressure of the oxygen



This Drawing Shows the Working Parts of the Machine: 1, Oxygen Tank; 2, Pressure Gauge; 3, Reducing Valve; 4, Inspirator; 5 and 6, Inlet and Outlet Slides of Controlling Valve; 7, Operating Bellows; 8, Dashpot Bellows; 9, Flexible Tubing; 10, Face Cap

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is now directed so as to create a suction, thereby causing exhalation of the oxygen previously forced into the lungs.

Then, when a certain vacuum is reached in the lungs and bellows, the outer atmosphere acts upon the latter, which in turn operates the controlling valve and again admits the oxygen to the lungs. The frequency of the inhalation and exhalation, which is thus mechanically made to imitate natural breathing, depends upon the size of the lung cavity, a large space requiring longer time, while with small lung cavities the operation is correspondingly more frequent. The mechanical inhalation and exhalation is continued until the patient shows signs of the return of natural respiration, then the action of the apparatus is discontinued and the patient allowed to breathe the pure oxygen through another small face cap connected by a hose directly to the oxygen tank. The face cap used during the early stage of the operation is provided with a device by means of which the patient's tongue is kept from obstructing the pharynx.

ITALIANS MAKE BOMBS WHILE FLYING

The airmen of the Italian military aeroplanes, which have been dropping bombs into the ranks of the Turks, do not start flight with the bombs loaded, lest the machines should come to earth heavily and thus cause disaster. Instead, the officer whose duty it is to drop bombs while his companion operates the aeroplane, fills each bomb as he requires it, holding the bomb case or shell between his knees and the screw-cap between his teeth, pouring the ingredients in as best he can. The bombs used are about the size of an orange.

Courtesy Illustrated London News

Dropping Bombs into the Ranks of the Turks from an Italian Military Aeroplane

MOTOR CAR CROSSES LAKE ERIE ON ICE

The automobile has conquered Lake Erie, not very far from where Commodore Perry achieved his famous victory almost a century ago. In fact the track of the automobile across the lake undoubtedly intercepted the paths of the "Lawrence" or the "Niagara" during the great conflict. A party of venturesome motorists are responsible for the conquest of the lake by a motor-driven wheeled vehicle. They set out from Catawba Island to make a trip over the ice to Put-in-Bay, O. On arrival at their original destination they were tempted by the great stretch of comparatively smooth ice to continue their journey all the way across the lake to Canada. Despite a driving snowstorm, the party, consisting of five men, made the trip. At times they were in imminent peril through broken ice and huge cracks, and it is estimated that the journey to Leamington, Canada, where they finally struck the northern shore, and back to Catawba Island, was between 125 and 150 miles

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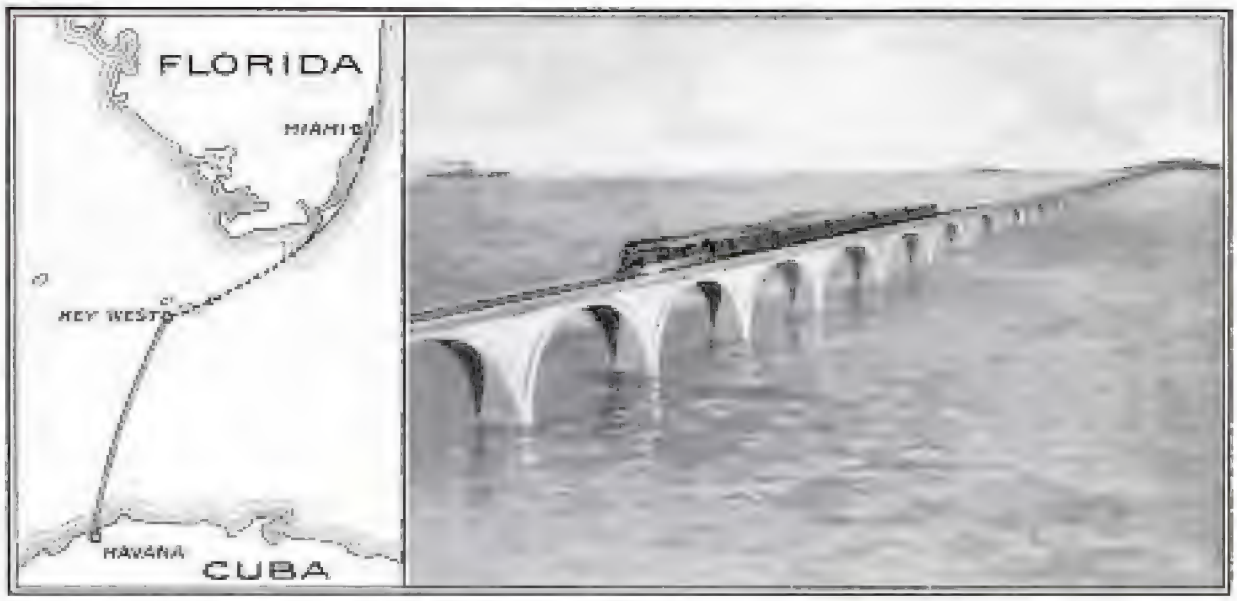

The Dotted Line Shows the Route of the Over-Sea Railroad to Key West, and the Lines Indicate the Route of the Car Ferries Which will Carry Through Trains to Cuba.—A Stretch of Concrete Viaduct over Open Water

long, although the lake at this point is just about 35 miles wide. The automobile was compelled to make wide detours to avoid ice hills and huge cracks. At one point where a fissure and a stretch of bad ice were encountered, boards were placed across the crack and the machine ran across on this improvised bridge. Part of the time the snow was so thick it was impossible to see 100 ft. ahead.

KEY WEST OVER-SEA RAILWAY OPENED

The Key West or over-sea extension of the Florida East Coast R. R., of which considerable has been published in this magazine during the past four or five years, was formally opened on Jan. 22. Key West is built on the last of the low coral reefs which curve around the lower end of Florida, extending far out into the waters of the Gulf of Mexico. The distance from Miami, which is on the east coast of Florida, at the northern end of the string of keys, is 150 miles, and the nearest Florida mainland, not following the keys, but directly across the water, is Cape Sable, 60 miles distant.

The story of the building of this railroad over the sea is one of the most remarkable and interesting in the railroad history of the world, but much has already been said of it. It is sufficient to restate that the line extends out, over the keys and the water between them, a distance of 128 miles from solid land. About 75 miles of the extension is over water.

CURTISS PATENT AGAINST WRIGHT MONOPOLY

Seemingly very much of a slap at the Wright claims to a monopoly of the air in the United States was the recent granting of a United States patent to Glen H. Curtiss, very completely covering his "lateral balancing rudders"—the type of separated ailerons long used on the Curtiss machines.

Since the Wrights have strongly contended that such ailerons constitute "lateral marginal portions" within the meaning of their patent claims, and therefore constitute an infringement upon their construction, the fact that the Patent Office has seen fit to grant a patent on the Curtiss application is most significant, and apparently goes a long way to uphold the views of those who regard the Wright patent as of little value.

¶An incombustible motion-picture film has been demonstrated before the Berlin Chemical Society and is reported to be a complete success.

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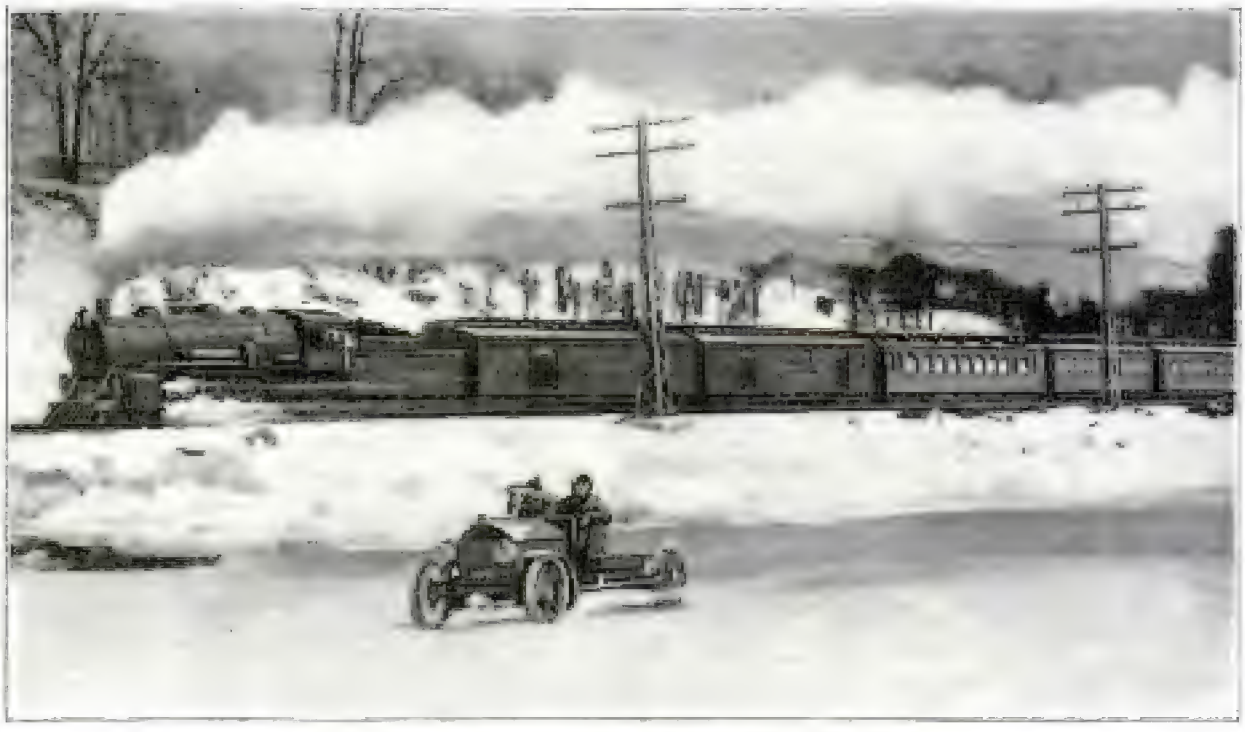
Photograph by Edwin Levick, N. Y.
Raising Stars and Stripes on S. S. "Finland"

BELGIAN LINERS NOW FLY AMERICAN FLAG

Impressive ceremonies were held aboard the Red Star liners "Kroonland" and "Finland" recently, incident to the raising of the American flag on these vessels in token of their transfer from the Belgian to the United States shipping register. The crew of each of the vessels were assembled on the quarter deck and the band played the national anthem. A brief prayer was offered after the flag was raised. The photograph shows the crew of the "Finland," Capt. Thos. G. Barnum in the center, saluting the Stars and Stripes.

The United States armored cruiser "Colorado" was temporarily disabled by collision with the liner "Cleveland" in Honolulu Harbor, January 24. The accident was caused by the sudden death of the pilot of the liner while taking the vessel into the harbor.



AUTOMOBILE RACES TRAIN ON THE ICE

A real race between a fast express train and a racing automobile occurred recently on the ice-covered surface of the Hudson River at Tarrytown, N. Y., the course being a true parallel. The train was the Twentieth Century Limited and the automobile was a 60-hp. machine driven by Fred Koenig. The race was over a two-mile course, and during the first half neither the train nor the auto had the advantage. Then the automobile gradually drew away and at the finish had an open lead of more than 100 yd.

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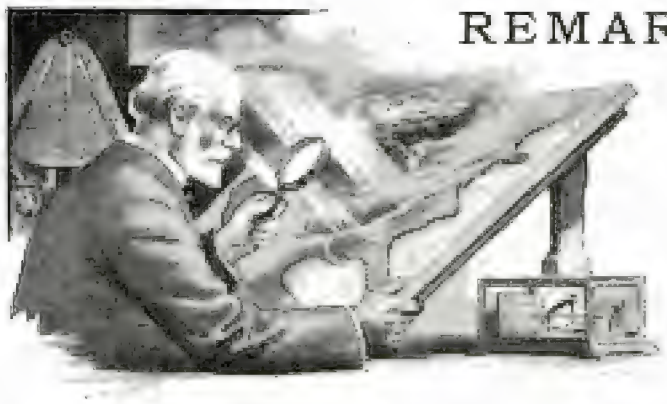

REMARKABLE WEATHER OF 1911

The Effect of the Combustion of Coal on the Climate — What Scientists Predict for the Future

By FRANCIS MOLENA

THE year 1911 will long be remembered for the violence of its weather. The spring opened mild and delightful, but in June a torrid wave of unparalleled severity swept over the country. The cities baked and gasped for breath, while the burning sun and hot winds withered the corn and cost the farmers a million dollars a day. A little later England was scorched and France and Germany sweltered. The mercury went above 100 deg. in western Canada, and whalers brought back reports from the Arctic regions of open water where always before there had been solid ice. The reports from Mexico and Central America would well describe the lower regions, but it is said that the summer in Iceland was enjoyable.

In August the elements took a different turn and the flood-gates of the heavens were opened. Kentucky and the South Atlantic states were deluged, and the Philippines were more thoroughly drowned than they had been before since the time of Noah. Alberta was visited by a killing frost which ruined hundreds of pioneer farmers. A cyclone devastated Costa Rica and a violent gale swept the South Atlantic coast, destroying a great number of vessels. During the later fall, the North Atlantic was tormented by a series of more violent storms than were known to the oldest sea captains. In November the southern states were visited by a killing frost, while December was remarkable for its high temperatures.

Aside from the extreme heat, the frosts of the far North and the sunny South, and the violent storms at sea, the year 1911 was still exceptional. The mean temperature of every month except November was above the average of that of the 40 years covered by the records of the United States Weather Bureau. The average daily excess was from four to six degrees.

With only one month out of twelve below normal, one may well ask if the climate is not changing and getting warmer. There is a general impression among older men that the good old-fashioned winters in which "the snow was fifteen feet deep and lasted six months" do not come any more. In spite of the fact that the year just past was above the average in temperature, there is no clear indication that there is any progressive change in the direction of a warmer climate. The average temperature of the year 1878 was as high as that of 1911. There seem to be moderate changes in a cycle of about 35 years, and it is suggested that this is related to the period of sun-spot activities, which is about one-third as long.

It has recently been found by archeologists from their studies in Asia Minor that, during the thousands of years these semiarid countries have been inhabited by civilized men, their populations have increased and decreased with a period of two or three hundred years. It is supposed that the epochs of greatest population were when there was more than the normal amount of rainfall, so that more people than ordinarily could be supported. When the oscillation in climate changed toward a dry period, so that food became scarce, the population necessarily decreased, though the changes might be ascribed in some instances to other causes. The cli-

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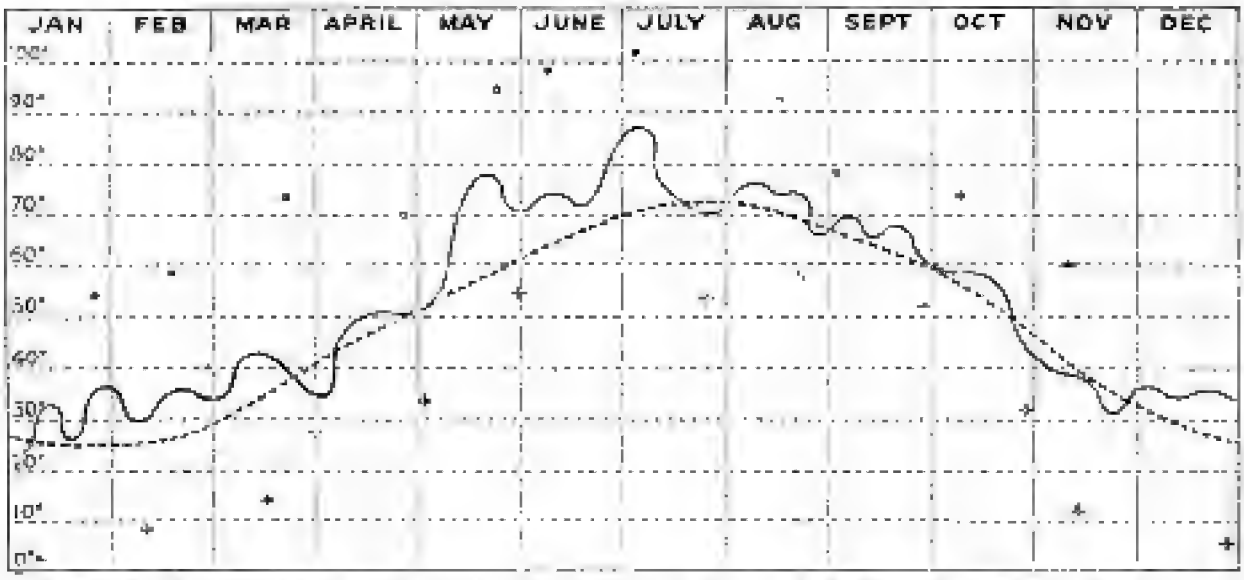

Temperature variations for 1911 as observed at Chicago by the U. S. Weather Station. The full curve shows the variations of mean temperatures based on weekly averages. The dotted curve is the mean for the 40 years covered by the observations of the Weather Bureau. The round dots give the highest temperatures for each month, and the crosses the lowest. In 1911 the average for each month except November was above normal.

matic explanation of these variations in population seems most reasonable.

But it is not necessary to refer to the history of mankind in order to prove that the earth has undergone much greater changes in climate than those we are now experiencing. The deposits of salt and gypsum which are found in New York and Michigan are the beds of ancient seas which dried up when these regions were deserts; on the other hand, arid Arizona was once watered with abundant rains, as is shown by the petrified remains of enormous trees which hundreds of thousands of years ago grew in that region. In frozen Greenland, the fossil remains of magnolias and other semitropical plants are found; while at the other end of the earth, near the south pole, there are beds of coal formed from vegetation which flourished when that region had a temperate climate.

On the other hand, time after time, great sheets of ice have pushed down from the table-lands of Canada through the valleys of the Great Lakes, over the prairies and across the hills, and have reached as far south as the Ohio and the Missouri Rivers. The records written on the hillsides by these slowly moving glaciers, and the heaps of soil and rounded boulders where they have stopped and melted, prove that at least seven times this country has been buried beneath the snow and ice. At other times, still earlier in the history of the world, there have been glaciers at moderate altitudes on both sides of the equator, well within the tropical zone. It is difficult to determine with any high degree of accuracy how long it has been since the last glacial epoch, but fifty or a hundred thousand years have passed since the ice sheets covered this region.

If the earth has undergone such remarkable changes in temperature and has experienced such extremes of drought and moisture, it may be asked what the prospects are for the future. It may be answered immediately that these climatic variations are so slow and that these cycles are so vast, that there is no prospect of any material change in the lifetime of a single individual, or even of a nation. It is highly improbable that the mean temperature will change sensibly in a thousand years, and very probable that it will not be much different from what it is at present ten thousand years from now. But if we may judge the future from the past, we may conclude that extremes of cold and warmth will succeed each other in long cycles measured by tens of thousands or hun-

The furnaces of the world are now burning about 2,000,000,000 tons of coal a year. When this is burned, uniting with oxygen, it adds about 7,000,000,000 tons of carbon dioxide to the atmosphere yearly. This tends to make the air a more effective blanket for the earth and to raise its temperature. The effect may be considerable in a few centuries.

dreds of thousands of years; for there is no more reason now to suppose that conditions will henceforth be fixed or even steadily progressive in one direction than there would have been to have made the supposition at the corresponding stage in any previous cycle. There are indications that the maximum of the warm era in which we now live has not yet been reached and that, therefore, the climate will probably become slowly warmer for some thousands of years, this progression being broken by many small oscillations. After the maximum is past the climate will, on the whole, probably steadily become colder until another ice age follows.

The causes of the changes are about as interesting as the changes themselves, and if they are known it may be questioned whether we can not control the climate in the future. While the heat which warms the earth comes from the sun, the climate is fundamentally dependent upon the earth's atmosphere and upon its circulation. It screens off the heat somewhat in the daytime and holds it in at night. The winds carry vast quantities from the torrid equator to the higher latitudes, and freshen the equatorial zone with the cooler atmosphere from the polar regions. The absorption and screening properties of the atmosphere depend upon its constitution. It has been found that if the air contained more carbon dioxide, which is the product of the combustion of coal or vegetable material, the temperature would be somewhat higher. In fact, a theory has been elaborated, primarily by the great Swedish scientist Arrhenius, that the earth has had a warm climate when the amount of carbon dioxide in the air was abundant, and a cold climate when it was scarce. It is believed that if the atmosphere contained two or three times its present amount, the climate would be considerably warmer, and that if it should lose half of that which it now has, the glaciers would again form in Canada. There are good reasons for believing that the quantity of this gas in the atmosphere may slowly undergo variations.

Since burning coal produces carbon dioxide it may be inquired whether the enormous use of that fuel in modern times may not be an important factor in filling the atmosphere with this substance, and consequently in indirectly raising the temperature of the earth. In the United States about 500,000,000 tons of coal were mined in 1911. Suppose four times this amount were mined and burned in the whole world. When this amount of coal is burned, 7,000,000,000 tons of carbon dioxide are put into the atmosphere. The question is, simply, whether this is an appreciable fraction of that which the atmosphere already holds, and whether there are any important ways in which it is being removed from the atmosphere.

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The atmosphere contains altogether 1,500,000,000,000 tons of carbon dioxide. Consequently the combustion of coal at the present rate will double it in about 200 years, unless it is removed by some means in enormous quantities. Carbon dioxide is removed from the atmosphere by growing plants, and in fact the carbon in the coal came from the air through the vegetable matter from which it has

Outline map of North America at the time of most extensive ice cap. The glaciers radiated from three points, covered 4,000,000 square miles, and were probably two or three miles deep in some places. They disappeared probably 50,000 years ago. There have been several glacial epochs and there may be others in the future.

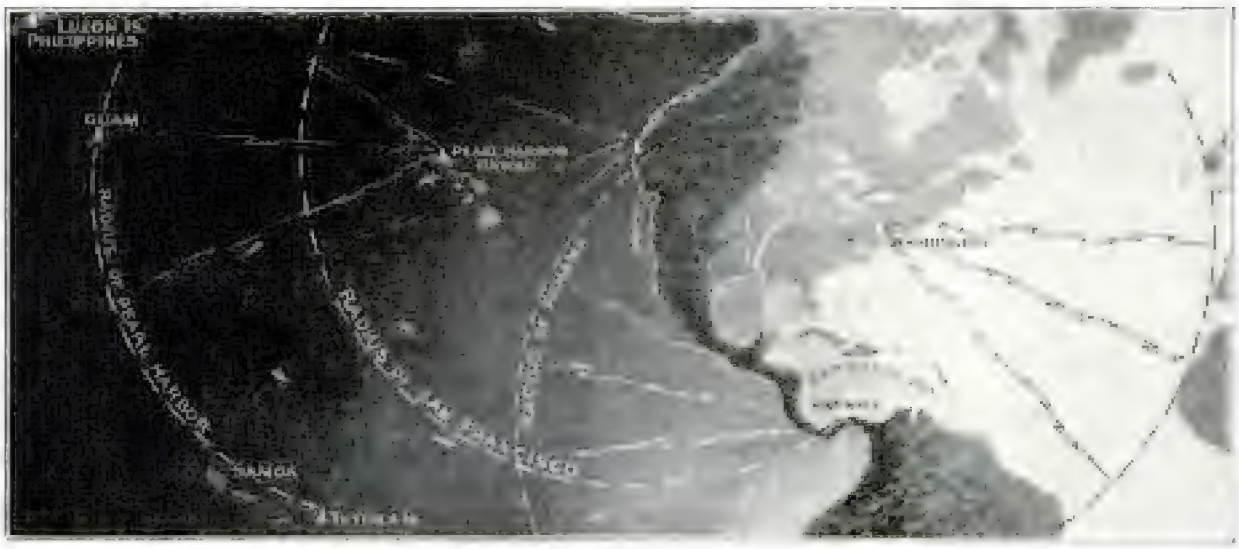
been formed. But when vegetable matter is burned, or decays, or is consumed by animals, the carbon dioxide is returned to the atmosphere. It does not seem that there will be in this way any great gain or loss in the next few centuries. A more important factor is the oceans which now hold enormous quantities of carbon dioxide and which, under suitable conditions, can absorb much more. In fact, they are the great regulators and have been involved essentially in all the variations of the past. But the action of the sea is very slow, and it may well be that the enormous present-day combustion of coal is producing carbon dioxide so fast that it will have important climatic effects.

It is perhaps somewhat hazardous to make conjectures for centuries yet to come, but in the light of all that is known it is reasonable to conclude that not only has the brain of man contrived machines by means of which he can travel faster than the wind, navigate the ocean depths, fly above the clouds, and do the work of a hundred, but also that indirectly by these very things, which change the constitution of the atmosphere, have his activities reached beyond the near at hand and the immediate present and modified the cosmic processes themselves. It is largely the courageous, enterprising, and ingenious American whose brains are changing the world. Yet even the dull foreigner, who burrows in the earth by the faint gleam of his miner's lamp, not only supports his family and helps to feed the consuming furnaces of modern industry, but by his toil in the dirt and darkness adds to the carbon dioxide in the earth's atmosphere so that men in generations to come shall enjoy milder breezes and live under sunnier skies.

NAVY PLANS EXTENSIVE WIRELESS FIELD

The Navy Department has prepared plans for a chain of wireless stations which will bring the department into aerial communication with all its battleships wherever they may be, almost from the coast of West Africa to Chinese waters. Congress will be asked to appropriate $1,000,000 to establish this system, which will be superior to anything of the kind now in existence in any part of the world.

The chain, as planned, will consist of seven stations. One is already under construction at Arlington, Va., across the Potomac from Washington. The others will be on the canal zone, at San Francisco, at Pearl Harbor, Hawaii, on the Island of Guam, on the Island of Luzon, in the northern



World-Wide Distribution of Wireless Impulses from Proposed Navy Stations. Messages will Fly Quickly from Parts of World on Which Sun Shines to Regions in Darkness of Night

Philippines, and on Tutuila Island, one of the American Samoan Islands.

The Washington station is expected to cover the entire Atlantic coast, with a sending radius of 3,000 miles. The station on the canal zone will cover the Caribbean Sea effectively, besides being in touch with both Washington and San Francisco. From the San Francisco station communication will be had with Pearl Harbor. The Pearl Harbor station will easily reach the Guam station, and the operator at Guam will be able to talk to the man at the Luzon station. From the Luzon station it is proposed to control all the naval vessels in Japanese or Chinese waters. The station in the Samoa Islands will cover the South Pacific. This station is especially desired, because there is now no cable at Tutuila Island.

Each of these stations will be equipped with 100-kilowatt generating apparatus. The design adopted for the Arlington station, now under construction, will be used; that is, three tall steel and concrete towers with the antenna stretched between them. The Arlington station is to have one tower 600 ft. high and two towers 450 ft. in height. It is estimated that if $1,000,000 only is appropriated, the other stations in contemplation will have only 450-ft. towers. Each of these stations will have a sending and receiving radius of 3,000 miles. This is what the stations are expected to do regularly under fair conditions, both day and night. Day communication is more difficult than during the night, as sunlight absorbs the electric waves sent out from the stations. Another thing, communication over land is more difficult than over salt water.

HIGH-VOLTAGE TRANSMISSION LINE IN EUROPE

The first high-voltage system, exceeding 100,000 volts, in Europe is being installed at Lauchhammer, Germany. Long transmission lines are not numerous enough abroad to encourage the use of exceedingly high voltage. The length of this line is only 35 miles and its voltage well up to the American limit. In a short time, however, America will have a line carrying 140,000 volts, such an installation being under way in the state of Michigan.

The extraordinary voltage, which is 110,000 volts, used for so short a transmission is due first to the fact that the total energy to be transmitted will be something like 20,000 kw., and secondly, to the design of the apparatus. Any voltage in excess of 65,000 requires special transmission apparatus, and as for reasons of economy in transmission this limit was too low, the figure of 110,000 volts was decided upon.

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AEROPLANE SEIZED AS CONTRABAND OF WAR

The aeroplane threatened for a day or two to disrupt the peace of Europe and involve Italy and France in a quarrel when, about the middle of January, the Italian government seized a French ship and arrested an airman named Duval who was taking passage, with his machine, to join the Turkish forces in Tripoli. This is the first time that the aeroplane has figured in an international dispute and it is also the first time that an aircraft has been declared contraband of war. The difficulty was overcome and the airman released when France assured Italy that Duval would not be permitted to join the Turkish forces.

The French war department has decided to recommend to the Chamber of Deputies the appropriation of $4,400,000 to be used for construction of aeroplanes during the next year. No definite plans for the expenditure of this sum were outlined in the brief dispatches received in the United States announcing the determination of the government officials.

The newspapers have contained several dispatches indicating that the variety of freak feats to be performed by the aeroplane has not yet been exhausted, either by actual performance or in the imagination of writers or airmen. From Los Angeles, where an annual aviation meeting opened Jan. 19, comes a story that while the airmen were gathering for the meeting, four of them were called upon by the sheriff to assist him in the capture of a couple of fugitives from justice who had eluded the posses organized to capture them. The airmen searched the country with field glasses from the vantage points of their machines, several hundred feet above the ground, but were unable to accomplish anything.

In Illinois a candidate for a state office announced his intention of engaging an airman to fly over the state and distribute circulars pleading for the suffrage of his fellow citizens. James V. Martin and Harry N. Atwood are both quoted in press dispatches as having announced their intention of essaying a transatlantic flight. Martin proposes to fly from Newfoundland to Ireland in a heavy biplane capable of carrying three passengers and equipped with wireless, etc. Atwood is said to have asserted that there is nothing impossible in the scheme of Martin and declares if he is provided with the proper machine, equipped with two engines and 200 gal. of gasoline, he will make the trip from Newfoundland to the Irish coast, in 40 hours.

The announcement was made Jan. 28 at Los Angeles that Glenn Curtiss had been awarded the annual trophy of the Aero Club of America for 1911 for the greatest achievement in aviation, the perfection of the Curtiss hydro-aeroplane being cited as the basis of the award.

The annual prize known as the "Criterium de l'Aéro Club de France," given the aviator making the longest continuous flight during the calendar year, was awarded to M. Gobé of France, for 1911. Gobé flew 740 kilometers, (about 460 miles), in 8 hr. 16 min. with a Nieuport machine, Dec. 24.

M. Prevot, driving a monoplane, is credited with setting a new altitude record with two passengers at Rheims, France, Jan. 22, when he reached the height of 2,200 meters (about 7,200 ft.). On the same day a new world's duration record for flight with two passengers was established by G. L. Ulich at Berlin when he flew 2 hr. 2 min. 45 sec. Maurice Tabuteau is reported to have broken three world's records at Pau, France, Jan. 24. He is said to have covered 200 kilometers (about 124 miles) in 1 hr. 54 min. 21 sec.; 250 kilometers (about 155 miles) in 2 hr. 22 min. 57 sec., and 300 kilometers (about 186 miles) in 2 hr. 51 min.

Pierre Védrines, who claimed to have made great speed on his Paris-

Madrid flight, again demonstrated his capacity for fast flying at Pau, France, Jan. 13, when he attained a speed of 88.84 miles an hour in a racing Deperdussin monoplane. While this time was officially taken by officers of the aero club who were on hand to verify it, as it was made for a distance of less than 5 kilometers (about 3 miles), it will not stand as an official record.

Three deaths were reported during the month ending Jan. 30 as due to aeronautics. In the United States Rutherford Page, a graduate of Yale university, fell a distance of 150 ft. at Los Angeles, Jan. 24, and was killed. Page had just received his license as a pilot. In France, Lieutenant Boerner, of the military aviation corps, was fatally injured, Jan. 19, by a fall at Senlis, France. The aeroplane caught fire after the fall and the airman was frightfully burned. He died Jan. 21. On Dec. 31 a German military balloon which had commenced a flight Dec. 26 was found in a lake 24 miles from Salzburg, the starting point, the aeronaut, Lieutenant Warner, having been drowned.

Emile Dubonnet, a French aeronaut, is credited with having broken the world's record for flight in a spherical balloon, the distance traveled having been 2,100 kilometers (about 1,300 miles). The start was made from Compiègne, France, at midnight, Jan. 7, in the balloon "Condor III," and a safe landing is reported to have been accomplished at a small village in the government of Kiev, Russia.

STRIKING MILL OPERATIVES HELD OFF BY HOSE

During the recent strike of the mill hands in the cotton and woolen mills at Lawrence, Mass., unique means were adopted to protect one of the establishments threatened by strikers. The crowds were prevented from advancing on the buildings by a continuous stream of water thrown at high pressure from a hose which was directed on a bridge, the only approach to the mill. The photograph reproduced above was taken during a snow storm.

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Courtesy Collier's Weekly

NO GOLD LACE OR FINE FEATHERS FOR THE "MAINE" INVESTIGATORS

Not a construction gang—but officers of the army and navy in their working clothes. From left to right: Commander C. F. Hughes, U. S. N.; Chief Constructor (Rear Admiral) Richard M. Watts, U. S. N.; Rear Admiral C. E. Vreeland, U. S. N., Colonel William M. Black, U. S. A., and Commander Joseph Strauss, U. S. N. This photograph was made on the wreck of the battleship "Maine" in Havana Harbor, while the board of officers appointed by the President was making the investigation which determined the cause of the disaster

SAN FRANCISCO'S CHINESE CELEBRATE REPUBLIC

Striking the Chinese "Liberty Bell" in San Francisco's Chinatown

The birth of the Chinese republic was celebrated in San Francisco's Chinatown by many curious ceremonies and a monster parade in which the flag of the new republic was carried. In the accompanying illustration is shown a Chinaman beating a bowl-like bell, which, according to the placard, in both Chinese and English, placed beside it, is the Chinese "Liberty Bell."

The census of the Dominion of Canada, recently completed, has caused some disappointment as the population is shown to be slightly in excess of 7,000,000 instead of more than 8,000,000 as had been estimated.

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COMMENT AND REVIEW

THE young men from the country come to the city full of expectation for the future. With many of them expectation is greater than ambition, and such fall an easy mark to those lazy, indifferent, insipid fellows who tell the newcomers "There are no chances any more." In proof they point out this millionaire who had the good "luck" to land in the town without a dollar but when a day's work paid for an acre of land which today is worth thousands of dollars per front foot. Inasmuch as those particular conditions are not the conditions of today, therefore there are no opportunities. They do not realize that in those early days there were scores and hundreds of young men who talked then just as they do now, and who were equally blind to the paths to fortune.

Opportunities of Today

A young man recently from the country who did not seem to be making the rapid advance he expected, was talking with the head of the concern for whom he worked and the latter said to the boy:

"What! no chance for a beginner? Young man, look out that window: See those skyscrapers on every hand? Well, those buildings are running over with opportunities of every kind—professional and commercial: They are filled with banks and big corporations. It takes men of brains and experience to conduct these enterprises, and such men command big salaries because they are scarce. It takes years of hard work and long hours to fit for the management or presidency of the enterprises over there, and only one young man out of hundreds seems to have the ambition and perseverance to make good. There are plenty of positions paying from $5,000 to $25,000 a year waiting for you; take your pick. You can have any one of them you really want, if you will only fit yourself for the job. The great trouble today in big concerns is to find competent men big enough to fill big places. You are now 22 years of age. If you will play the game fairly, according to the rules, which are honesty, perseverance, morality and your-mind-intensely-on-the-job all the time, when you are 45 and perhaps sooner, you will have landed in the place you can select this minute. Unusual natural ability combined with the qualities named may make a short cut to success, but fellows with less natural ability who earnestly fulfill the other requirements will win where the more brilliant man, neglecting them, fails."

Just then the lights began flaring from one office after another along the walls of towering buildings, like so many opening eyes. "Young man, your opportunities are already calling you: select your beacon and win it."

HERE is a story of the success of two young men who went from the city to North Dakota. Each had about $15,000 of which $8,000 was put into machinery. This provided them with two powerful traction engines, and the necessary equipment of farming machinery. Operations were begun with breaking the raw land in March, 1911; by November of the same year the young city-farmers had marketed $60,000 worth of flaxseed, which was hauled 40 miles to the nearest railroad station. The entire undertaking was managed on modern lines: A day's plowing with each engine was estimated at 25 acres, but when the crew by saving time turned 30 acres in one day, they were given a bonus of $5.

The Modern Way

Thereupon 30 acres per day became the usual thing. The same broad-gauge, liberal policy characterized the whole undertaking. The most competent men obtainable were hired and well paid; the aim being to do the largest amount of work that could be done well, in a day, and pay accordingly. Neither of these young men had ever raised any flax, but they went to the agricultural station and thoroughly posted themselves. This was a success which could not have been obtained with mere ability, willingness and a pair of hands; it required capital, yet it was brain and initiative which won; for not only was the crop itself highly profitable but the land advanced in value in that one season more than the entire expenditure for machinery.

In these days the really successful farmer must possess brains and machinery.

Beauty as an Asset

WE Americans are gradually coming to recognize a positive asset—a prosaic monetary profit—in an architecturally beautiful structure. Europe long ago learned this lesson; we have yet very much to learn. In all the large cities of the Continent one is not permitted to erect a building which will prove a disfigurement to surrounding structures, or to the symmetry of the street on which it fronts. Thirty years ago our commercial buildings were put up with a view chiefly to secure a certain amount of space protected from the weather. This was the period of flimsy construction, bare utilities, resulting in buildings that were dangerous fire traps, and which frequently tumbled down from overloading. The next step was toward more substantial structures, better light and sanitation. Yet when an owner planned, say, a $100,000 factory, he regarded the architect's plea for an extra $5,000 for interior and exterior decoration as absurd and impossible. He refused to entertain the idea. The building must cost the least possible amount compatible with the law. And yet the interest at 6 per cent on the amount represented by the difference between an actually hideous front and one permanently pleasing and ennobling was only $300 a year.

Environment has so largely to do with results. Imagine, if you can, Shakespeare trying to write one of his plays at a desk in a modern department store! An extreme case, to be sure, yet it has been demonstrated time and again that in a factory the quality and quantity of the output is noticeably affected by the surroundings in which employes work. The same is true in an office. Appropriate fittings inspire a definite dignity and respect for the establishment, which have an actual commercial value. Picture a bank cashier talking across a counter like a butcher's block! An attractive exterior and interior of any business concern has a definite advertising value at a minimum of cost.

We have left too much to the engineer, and sought too little from the architect. Hundreds of bridges may be seen in our large cities which have been built with the one aim to sustain a certain number of tons at one time. A bridge should be a thing of beauty, yet how seldom do we see in this country a beautiful bridge. In Europe, for years past, the architects have built the bridges, beautiful bridges, as they did the cathedrals which Americans travel thousands of miles to see. An architect who can build a 20-story office building 150 by 100 ft., capable of safely carrying a load of 8,000 tons, surely can plan a bridge 150 ft. long to carry a load of 500 tons. No good architect would ever have been guilty of such a monstrosity as the elevated

railway loop in Chicago. It would have cost a few hundred thousand dollars more to have made a sightly structure; but is not this much due the public whose streets the railroad uses as a free right of way?

In speaking of the city of Gary—the town built by the United States Steel Corporation—a leading Chicago architect said: "The company failed to provide the beautiful surroundings which they had the opportunity to do in building Gary. Having decided to build a manufacturing plant in such a way that the economies would be conserved without cross currents from the side of raw material to the side of finished product, millions were put in gas engines as an illustration of the saving between the gas engines and steam engines, thus bringing the efficiency of the plant up, theoretically, to 100 per cent. whereas the efficiency of the human beings is only about 70 per cent. The reason for it is that they have failed to provide the comfortable housing necessary for the workers, and parks and recreation grounds, in order to give the same consideration to the human beings in their employ as to the machinery part of the organization."

"WHY not a business man for President?" is the question of E. C. Simmonds, a successful manufacturer of St. Louis, in a notable article on government and business, printed in the Chicago Tribune.

Government a Business Proposition

Is it not about time a President were selected from the business interests of the country? Of our 26 presidents, 19 were lawyers, 2 statesmen, 2 soldiers, 1 public official, 1 planter and 1 a farmer. Nine were not college graduates. In the House of Representatives 70 per cent are lawyers. In these modern days the conduct of the government of a big country like this is certainly more one of good business management than of diplomacy. The State Department has to attend to diplomatic affairs anyway. While many congressmen are admittedly able men, of the great majority how many ever were or ever would be successful managers of any large business interest?

By good business management is not meant some star official of a big trust; quite the contrary. As Mr. Simmonds suggests, the type of business man contemplated is that of the late Marshall Field—a man of large affairs. Such men in congress and the White House would sweep away the cobwebs of red tape, put the departments on as economical a basis as compatible with good service; increase efficiency by team work and secure that same enthusiasm in departments that soldiers and sailors display toward their generals and admirals when something is doing. How long would a bank, factory, mine or store last in these days, if conducted on business principles which characterize a great deal of government management?

If ours were not a vast, rich country, it would go broke. What this country needs in its city, state and national officials is men of honor who already have demonstrated their natural ability and fitness by having made a pronounced business success. The day is not far distant when their duty to their fellow-citizens will impose the same obligation on these men to leave their desks and take office, to which they would respond if called upon to defend their country from a foreign foe.

H. H. WINDSOR

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LOW TEMPERATURES AID HIGH JUMPS

The most wonderful jump in the history of skiing is credited to Harold Smith who is said to have leaped from the side of a mountain at Davos, Switzerland, and to have made a safe landing hundreds of feet below. The art of using skis is peculiar to people who live in the cold bracing weather of the northern latitudes, where low temperatures make possible plenty of hard-packed snow at all times. Its charm is said to lie particularly in the high jumps that can be made, jumps that begin in slides from high hills which send the skier into the air by means of an obstruction, natural or artificial, placed in his path, the impetus received from the preliminary slide sending him for a great distance before again touching the surface of the snow.

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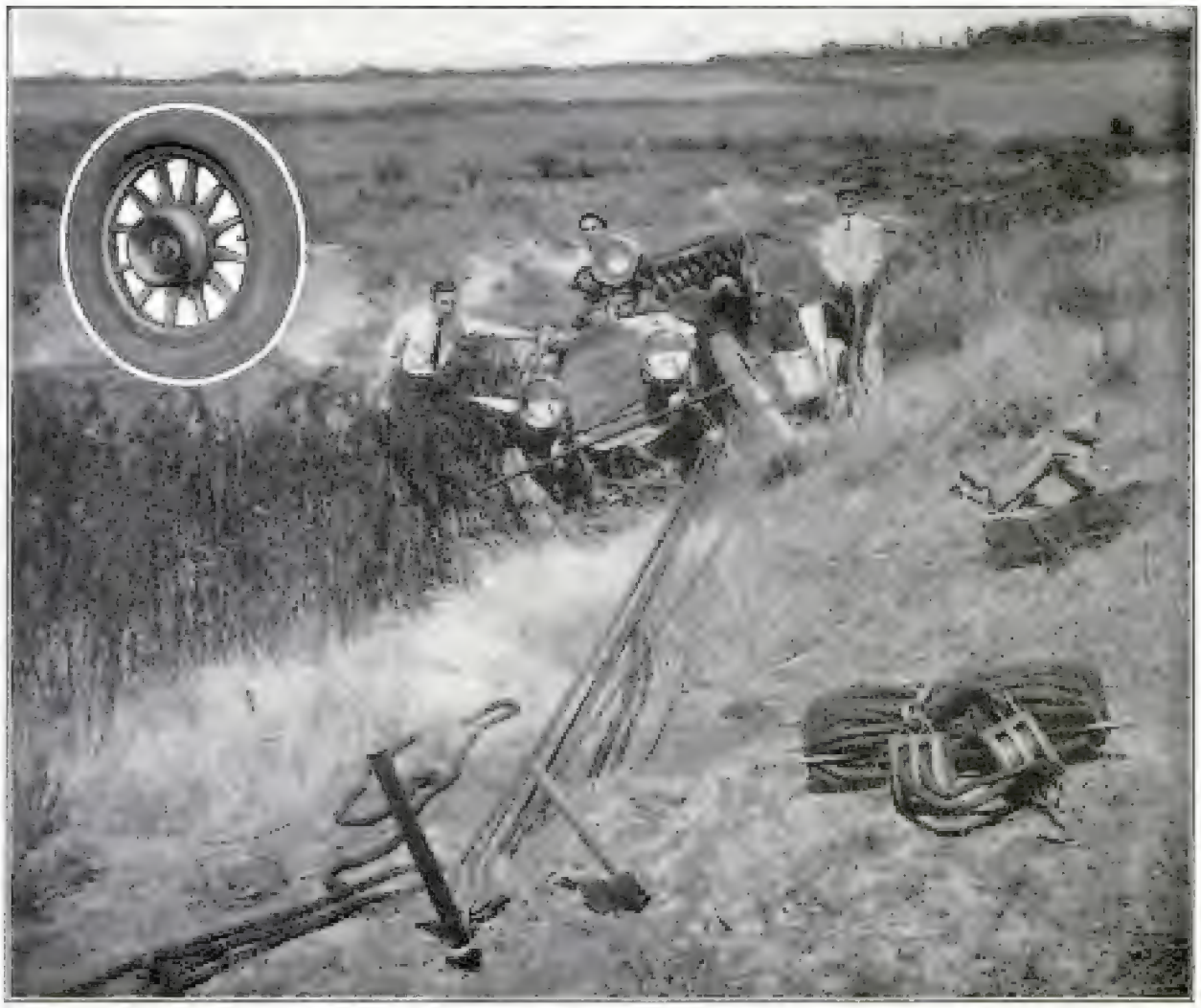

Pulling an Automobile Up the Steep Bank of a Washout with Block and Tackle. The Insert View in the Upper Left-Hand Corner Shows One of the Capstan Drums Attached to the Hub of One of the Rear Wheels

BLOCK-AND-TACKLE OUTFIT FOR AUTOMOBILES

A Californian, whose business keeps him traveling by motor car over all kinds of roads and in every kind of weather, has equipped his car with a block-and-tackle outfit for emergency service. The accessories of the block and tackle are an iron stake, the necessary rope cable and two capstan drums, the latter being fitted to the hubs of the rear wheels. In case the car becomes bogged in a mud hole or sticks in the heavy sand of a washout, he is not at the mercy of a chance farmer with a team of mules, but simply drives the iron stake some distance ahead of the car, adjusts the block and tackle, takes a turn of his cable around one of the capstan drums, starts the engine and pulls himself out with ease.

An interesting feature of the outfit is the removal of the rear seat and the substitution of a box for the storage of the block and tackle, containing 500 ft. of rope, tools, and a camp outfit for use through unsettled districts.

¶ The final award of the $10,000 prize for the Statue-of-Liberty flight at Belmont Park, N. Y., in October, 1910, has been made to Claude Grahame-White by the International Aeronautic Federation. This race was actually won, in point of time, by the late John B. Moisant, but he was disqualified, and the question of the award has been before the Federation ever since, several decisions having been made and reversed.

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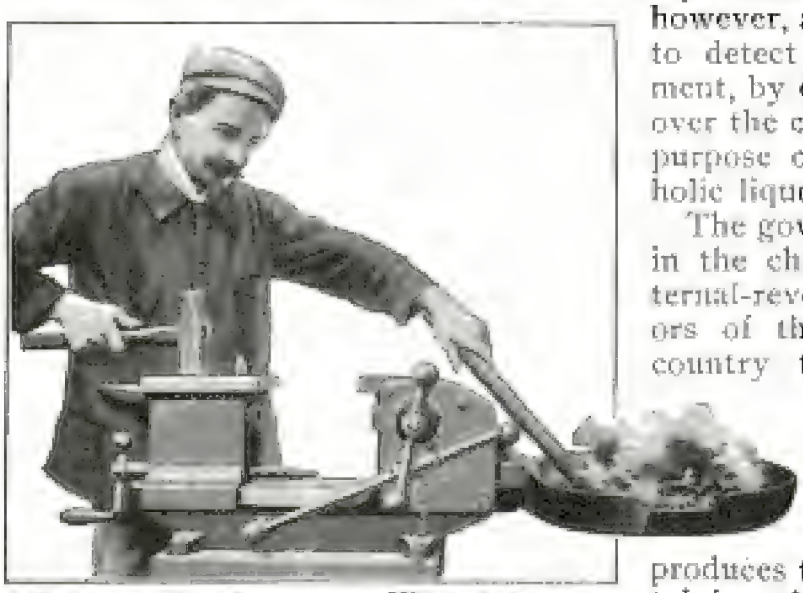
MANY MECHANICAL TOOLS COMBINED

An ingenious combining of mechanical tools, devised by a Frenchman, is here shown. It includes a forge, anvil,



A Mechanical Tool Combination, Which Includes an Anvil, Boring Machine, Vise, Grindstone, Forge, Punch and Workbench

boring machine, vise, workbench, grindstone and punch, yet weighs only 132 lb. and occupies but little space. The steel anvil, which can be moved along its cast-iron base by the turning of a screw, forms one jaw of the vise, while the other jaw is a fixed steel block provided with a tool head and screw clamp for the attachment of drills and other tools. One end of the apparatus also carries a dustproof tool box and a grindstone. The forge is simply an iron pan connected with a blower, and can be removed when not needed. Power is furnished by a treadle, and the transmission is devised to give either low or high speed, as required.

DISTILLERY OPERATED BY UNITED STATES

The United States Treasury Department is running an unlicensed distillery. The law is not being violated, however, as the plant is operated solely to detect fraud against the government, by exercising a scientific control over the commercial distilleries for the purpose of revenue taxation on alcoholic liquors.

The government apparatus is located in the chemical laboratory of the internal-revenue bureau. The inspectors of the bureau are scouring the country to secure the formulas of every distillery for the manufacture of their product. Using these formulas, the government in its own distillery reproduces these alcoholic liquors, ascertaining the exact amount of distilled spirits which should be yielded by any given quantity of grain according to any given formula.

These results are compared with the returns made by the distilleries for the purpose of taxation. In all cases where a marked discrepancy is displayed the distillery is placed under suspicion, and if the returns prove fraudulent, the plant becomes known as a "pirate distillery."

By this method the government also holds a tight check on the internal-revenue officers stationed at the distilleries to guard the revenue. If there is any collusion between these officials and dishonest distillers, the government distillery reveals the fact, and the official head of the employe falls.

WORLD'S LARGEST BLOCK OF GRANITE

For two years granite quarriers have been working away cutting out the immense block from nature's storehouse, at Barre, Vt. Even now, it is not removed from its original resting place, nor have they gotten the exact dimensions of the monster. They know, however, that in rough figures, the mighty block exceeds 230 ft. long, 65 ft. wide, and is at least 30 ft. in depth. Since clearing away the face, it has been found that the depth will exceed 30 ft. as no sign of the bottom bed is yet reached. Taking the above

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Block of Granite being Quarried at Barre, Vt. Its Immensity may be Judged by the Relative Size of the Workmen on the Corner of the Great Block

figures as criteria, the block weighs about 75,000,000 lb.

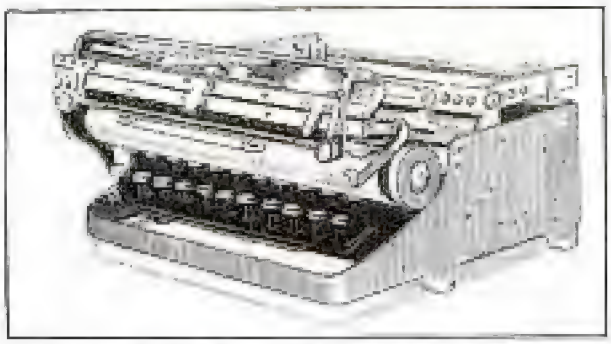
The drilling and cutting out of the monster block have involved a patience, persistence, nicety of calculation and judgment that would be almost unbelievable, except to those who know the difficulties of this undertaking.

¶Luther Burbank is claimed to have discovered that the fiber of the spineless cactus is an excellent substitute for rubber in the manufacture of automobile tires, and that the plant can also be converted into paint. One leaf, it is said, will make 10 gal. of paint.

¶The ever-present moving-picture maker has at last broken into the aviation field, a machine and an operator having accompanied Robert G. Fowler for a short distance across Texas, for the purpose of making a series of films.

EUROPEAN FOLDING TYPEWRITER

This typewriter, which is of European manufacture, has a carriage which folds forward over the keyboard, forming a square body of small dimensions and weight, easily incased and carried when traveling. The machine is solidly built and modern in construction, the writing being visible and in a choice of two colors. The keyboard bears 90 characters.



A French Visible Typewriter, the Carriage of Which Folds Forward over the Keyboard for Carrying

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SCORCHING POSTCARDS ON LAVA BEDS

One way of securing unique souvenirs is shown in the reproduction of this photograph of tourists in

Tourists Scorching the Edges of Postcards in the Crevices of Lava Beds in Hawaii

Hawaii, who are engaged in scorching the edges of picture postcards in the cracks of a lava bed. This bed of lava is quite cool and hard on the surface, so there is no danger in the process, but in the cracks formed by the cooling of the crust there is sufficient heat to brown the cards neatly at the edges, and in that condition they are mailed to distant friends. Hundreds of visitors from Honolulu visit this spot every year and go through this rite peculiar to the place.

UNITED STATES' PRODUCTION OF PORTLAND CEMENT

The production of Portland cement in the United States reached the enormous total of 76,549,951 bbl. in 1910, according to figures just issued by the Geological Survey, the value of which is given as $68,205,800. This is an increase over the production of 1909 of 11,558,520 bbl., or nearly 18 per cent, and an increase in value of $15,347,446, or more than 29 per cent. This increase alone is greater than the total output in 1900, when the production first passed the 10,000,000-bbl. mark, and the production of 1900 was an increase of 2,600 per cent over the production of 1890. Measured by the capital invested, the cement industry is one of the world's three greatest extractive industries.

WALL BUILT TO STOP EVIL SPIRITS

The Chinese believe that evil spirits are able to move only in straight lines, and that they cannot penetrate through solid matter, therefore, the problem of keeping them out of a dwelling or a garden seems to them a simple matter. On passing through the entrance of the ordinary middle-class home in China, it is necessary to turn to the right or left because of a fixed screen, the purpose of which is to keep evil spirits out. Likewise, just back of the entrance to a walled garden, may sometimes be found a wall of the type shown in the illustration, erected for the same purpose.

A Wall Built Back of the Entrance of a Chinese Garden to Keep Evil Spirits from Entering

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CANARY BIRDS IN MINE-RESCUE WORK

That canary birds are destined to play an important part in mine-rescue work was proven for the first time to the United States government in its rescue work recently at the Cross Mountain mine explosion at Briceville, Tenn., in which 89 miners were killed.

It was the first chance for the government rescue workers to test the value of canary birds in connection with their work, and for the first time the rescue cars each had from one to three dozen birds on board as part of their equipment. It was known that the canary bird is very susceptible to impure atmosphere and this led the government experts to experiment with them in air of unknown quality in the depths of mines.

Government rescue men equipped with the new oxygen-making machines strapped to their backs, and protected with hoses leading into their mouths, entered the mine depths with these canary birds and a squad of unmasked volunteer rescuers. The birds were watched closely as the party moved further into the tunnels of the mine.

Mine-Rescue Worker, Equipped with New Oxygen-Making Machine and Canary Birds, About to Enter a Mine after Explosion

As long as the birds remained cheerful and hopped about in their cages it was known that all was well with the surrounding atmosphere, but suddenly when the birds began to droop and gasp for breath it was realized that the traces of the deadly "afterdamp" were present and the unmasked volunteer rescuers with no oxygen equipment had reached the place for them to stop, for no one but the men with the oxygen machines could penetrate into the death-dealing atmosphere beyond.

The canary birds drew the line of safety. At no time were the rescuers exposed to the dangers of the afterdamp. It was the first time in mine-rescue work where rescuers were not brought forth overcome with gas and afterdamp.

TREATMENT OF CANCER BY FULGURATION

The apparent increase in the number of cancer cases has led physicians to put forth the greatest efforts to find a cure for that dread disease. Many methods of treatment have been devised and much study has been given to determining the cause. No definite cause has been established, and the great number of methods of treatment employed shows that no absolutely successful one has yet been found.

Dr. De Keating-Hart, a noted cancer authority, of the Hospital Saint Luc, Paris, has originated a treatment which he believes is the most successful yet employed, and in New York recently he explained and demonstrated his electro-surgical method which he calls "fulguration." The word means flashing, lightning-

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like, and the treatment consists in applying to the region of the cancer powerful electric sparkings of great frequency and high tension from a coil or a static machine, using special electrodes for applying the spark after first cooling it. This does not destroy either the cancer tumor nor the surrounding tissue but acts on the soil in which the cancer grows, cutting off its supply of nourishment and preventing a recurrence. The best results are secured by first removing all the cancer tissue possible by the knife and then applying fulguration, which prevents the growth of any remaining cancer tissue in the neighborhood.

Radium, the X-ray and the Finsen light or violet rays have also been used for this purpose, and with good results in many cases. Both Dr. Doyen and Dr. Nagelschmidt have tried to destroy cancer by the electric spark, but by their methods the tissues were burned in an objectionable way. Dr. De Keating-Hart's method avoids this, and is a valuable palliative and curative method in inoperable cancers. In 70 per cent of these hopeless cases it stops the growth, relieves pain, causes healing and the patient becomes stronger and lives longer. Cancers on the skin and mucous membranes of the mouth and elsewhere have been cured in 83 per cent of cases with no return in one to two years. Cancers of the breast have also been cured, apparently with no return in three years in 40 per cent of cases. The method is being used at the New York Skin and Cancer Hospital.

INTAKE GATES OF THE LOS ANGELES AQUEDUCT

The Los Angeles aqueduct, without doubt one of the greatest civic achievements of history, is now within one year of completion. By means of this water course, 240 miles in length, that skirts the Mojave Desert for 130 miles and tunnels a mountain range, the city of Los Angeles will ultimately take her domestic water supply from the Sierra.

The accompanying photograph is the first to be printed of the giant gates at the head of the aqueduct through which the Owens River will be diverted into the man-constructed channel that is to carry it so far southward.

The entire diversion works are of concrete masonry many feet in thickness and reinforced with steel. The gates which are four in number are approximately 10 ft. high and 10 ft. wide. They are of solid steel, semicircular, and work on pivots, being so nicely adjusted and balanced that they are easily opened or closed by hand.

The photograph is taken from be-

The Giant Intake Gates of the Aqueduct, by Means of Which Los Angeles will Bring Its Water Supply from a Distance of 240 Miles

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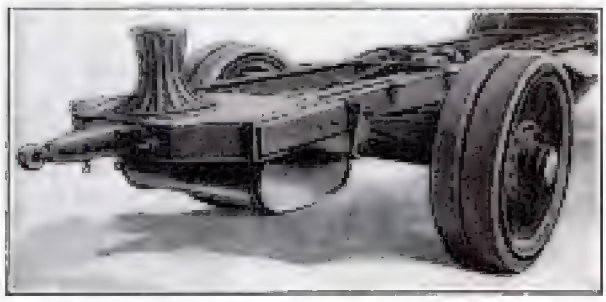
low, the Owens River being shut off by a temporary earthwork embankment. The size of the gates and the dimensions of the concrete structure will be appreciated, if they are compared with the number and the height of the men seen in the foreground.

ARMY TRUCK PROVIDED WITH A CAPSTAN

One of the motor-truck manufacturing concerns of Paris is equipping several of its army and commercial trucks with capstans, mounted at the rear end as shown in the illustration. The drive for the capstan is by means of a horizontal shaft operated by worm gearing from the jackshaft, and allowing of the use of the four gears normally used for driving the vehicle. Locating the capstan at the rear does not necessarily curtail the length of the body, for on the type of open or closed body,



The Motor-Operated Capstan and Spring-Buffer Coupling for Trailers are Features of a New Military Motor Truck Built in Paris

built to fit the army regulations, the clearance between the top of the frame members and the bottom of the body is sufficient for housing the capstan.

Another feature of these trucks, also shown in the illustration, is a coupling provided for the use of a trailer. It is composed of a steel housing bolted to the transverse rear-frame member and containing a connecting link having spring buffers.

"STREAMLINE" PIPE FOR MOTORISTS

Variously shaped pipes have been designed for motorists who wish to enjoy tobacco without discomfort when traveling at high speeds, and the accompanying illustration shows one

A Pipe Designed for Motorists Who Wish to Smoke while Running at High Speeds

type of "high-speed" pipe in action. It is called a "streamline" pipe, because the shape of the bowl is in accordance with the streamline form, which is calculated to offer the least wind resistance.

BENT SWORD AS MESSAGE OF PEACE

Following the capture of the village of Kebang by the British expedition in penetrating the Abor country of India to suppress the savage natives, the chiefs of Damroh, which is the chief village of the Pedam Abors, sent a letter or message begging for peace. This message consisted of a sword and a spear, both of which had been bent.

A Bent Sword and Spear Sent to a British Expedition in India as an Abor Token of Peace

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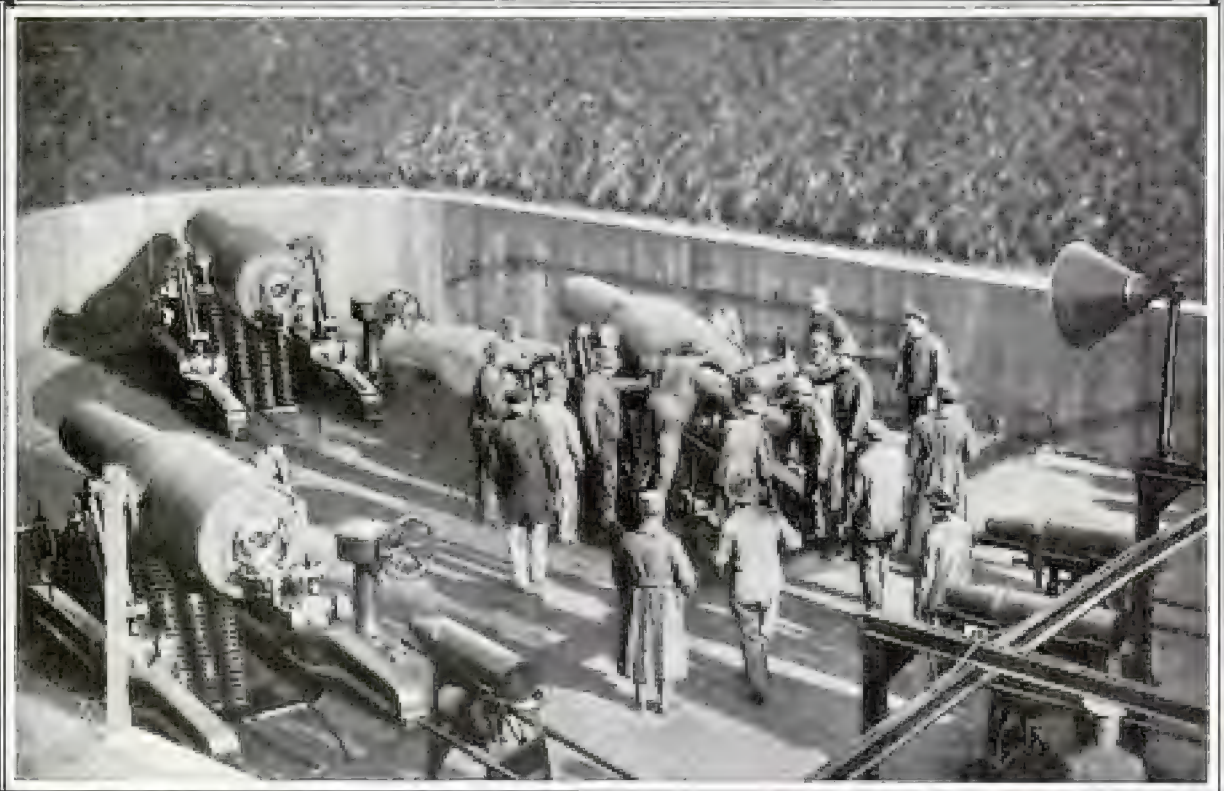
INTERIOR OF A MORTAR PIT AT FORT TOTTEN

Loading a 12-In. Mortar. Three of the 1,000-Lb. Projectiles on Trucks in the Foreground



Artillerymen Preparing One Section of the Mortar Battery at Fort Totten for the Test

Artillery and ordnance officers at Fort Totten, New York Harbor, recently tested a set of gun carriages built for 12-in. mortars, a battery of eight of these guns being fired with full charges at various ranges and under varying conditions for the purpose of the test. The mortars are among the most deadly weapons of coast defense. They are mounted in groups in an emplacement known as a "pit," which is

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DURING RECENT TESTS OF IMPROVED MOUNTS

Photograph Made an Instant after Firing of a Mortar. Most of the Plates Used in Trying to Make Pictures on This Occasion were Broken by the Shock of the Explosion

Method of Transporting the 1,000-Lb. Projectile by Trolley from the Magazine to the Pit. As Much of This Work as Possible is Done by Machinery

One of the Mortars Ready to be Fired. The Gunner is Seen with the Lanyard in His Hand, Ready to Discharge the Piece and Send a Shell 10 Miles Out to Sea

usually divided into two sections, four of the guns being in each section, eight constituting a battery. The guns are short, stubby pieces of artillery of an ominous, bulldog type, and their mission is to send a 1,000-lb. shell high in the air to drop finally on the deck of a ship. They are effective up to a range of 10 miles, and American gunners have attained a remarkable degree of accuracy with them.

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A GIANT IMITATION SPIDER WEB

This odd imitation spider web is found on the country estate of a Chicago man who was searching for unusual decorative effects. It is 60 ft. wide by 40 ft. high, strung between two large trees, and one may easily climb to the top of it. At a distance, the illusion of actual spider's work is said to be perfect. The web is made of rope.

An Imitation Spider Web, 60 Ft. Wide by 40 Ft. High, Strung between Trees on the Country Estate of a Chicago Man

ILLUMINATED FLOWERS AS HAT TRIMMING

In a search for bizarre ideas in millinery designs, one milliner has displayed several evening hats or bonnets trimmed with illuminated flowers. Each flower contains a tiny electric bulb and the battery is carried in the crown of the hat. A hidden switch enables the wearer to throw the "headlights" on or off at will.

A GLACIER TOMB GIVES UP ITS DEAD

Because of the excessive heat of the last summer in Europe, the glaciers of the Alps underwent exceptional changes, and one glacier tomb has given up one of its dead, while the bodies of other climbers lost several years ago may yet be found. The body found was that of a young electrician who was lost in the famous Loetschen glacier in 1899. Two Englishmen were lost in the same glacier in 1895, and the alpenstock of one of them has been found, which leads to the belief that the bodies might also be recovered.

It is of interest to note that the number of lives lost each year through accidents while climbing the Alps is fully twice that of the aviation death list. The greater number of deaths are due, of course, to inexperience on the part of tourists. After making trips with guides, they often start out alone on climbs which to them seem simple. They lose their footing, or slip through a crust of snow which is apparently safe, and are swallowed without hope of escape, or dashed to their death.

PROGRESS IN LONG-DISTANCE TELEPHONY

Two long-distance telephone conversations carried out recently in experimental work, are of much interest, not because of any exceptional distance between the points, but because of the condition or nature of the territory lying between. One of these conversations occurred in Europe and the other in this country.

The European conversation was held between London and Basel, Switzerland, the distance being 620 miles. The experiment is one of the many being made to ascertain how far the

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public telephone service between England and the continent may be extended through the medium of the new and improved cable across the English Channel. Conversation was maintained quite easily in this test.

In the other instance the conversation was between San Francisco and El Paso, Texas, a distance of 1,296 miles over mountain, valley and plain. This establishes a new record for long-distance telephone conversation in the west, and was made possible by the completion of new lines in New Mexico.

MILK-CAN LOCK USED IN ENGLAND

The milk-can holder and lock shown in this illustration has been invented by an Englishman to prevent thieves from stealing the milk after delivery to the door of the customer. Attached to it is one of the types of milk cans used to deliver milk in that country. The milk-can holder is attached knocker-fashion to any door, the tube with which its base is provided protruding inside the door. The milkman, in delivering the milk, inserts the handle of the can in the circular teeth, which lock automatically. A chain, attached to the locking mechanism, passes through the tube and hangs down inside the door. The only way to release the catches of the lock is by pulling this chain.

Locking Device to Protect Milk Cans from Thieves

¶As the result of reports from engineers to the French ministry the project to build a ship canal from Paris to Rouen has been dropped.

FIRE TOOLS IN THE FOREST

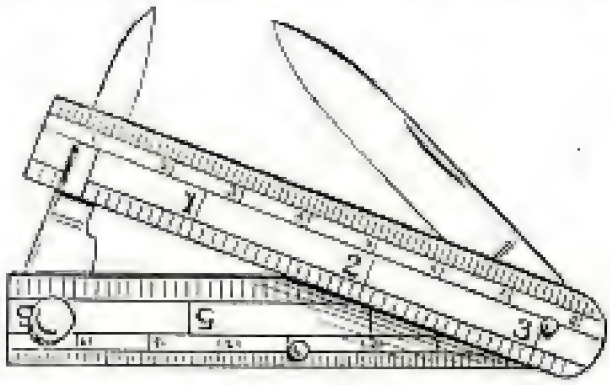
One means, newly adopted, by which provision is made for quick attack upon fires in the national forests, is the keeping of fire-fighting tools at many different points, where they will be immediately accessible in case of emergency.

Boxes for Fire-Fighting Tools in the San Isabel National Forest

The tools for this purpose are housed in boxes such as those shown in the accompanying photograph, taken in the San Isabel national forest. Chief among them are spades, axes, and pick axes.

COMBINED PENKNIFE AND SIX-INCH RULE

An interesting combination of pocket tools is shown in the accompanying illustration. It is a two-bladed penknife, one side of the handle of which, when extended, is a 6-in. rule, which gives both the standard and metric systems of measurement.



A Penknife, the Handle of Which is a Six-Inch Rule

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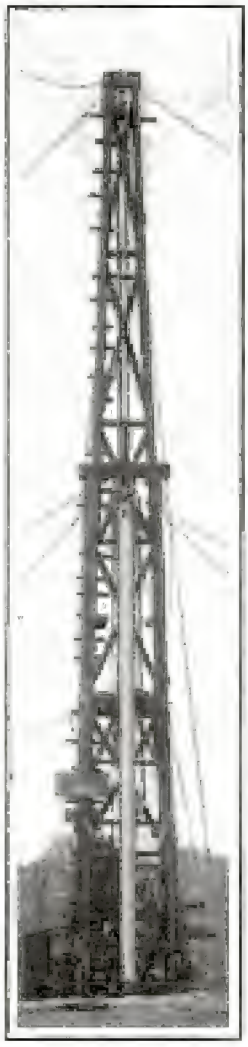
INTERESTING TEST WITH CONCRETE PILES

A concrete pile, 16 in. in diameter and 60 ft. in length, said to be one of the longest concrete piles of that size ever constructed, was recently used in Washington when an experiment was made to devise a suitable foundation for the magnificent city post office which is soon to be erected adjoining the Union Station, and but a short distance from the National Capitol.

The site on which the post office is to be erected, besides being ground that was filled in at the time the station was built, is directly above the bed of a stream that flowed through that section of Washington many years ago. Test borings showed that the foundation would have to be an unusually deep one because of the peculiar nature of the ground.

Officials of the office of the supervising architect of the Treasury Department, which has charge of the erection of all government buildings, finally decided to experiment with concrete piles and accordingly two of them, 60 ft. in length, were made. These piles were reinforced with six 1-in. steel bars.

By means of a steam hammer, three 20-ft. sections of steel tubing, having an inside diameter of 17 in., were first driven into the ground. A cone-shaped point of iron was fitted to the end of the first section of the tubing. When this was driven into the ground the additional sections were connected to it by means of heavy drive-pipe couplings.



One of the Reinforced Concrete Piles Used in Government Test

When the time came to lower the concrete pile into the tubing, the biggest task of the whole experiment was encountered, for the officials of the office of the supervising architect feared that the pile would be broken in half during the operation.

With the use of an 80-ft. derrick and skillful rigging, the pile was lowered into the tube, however, without a mishap. Clamps were then attached to the end of the tube which was soon withdrawn from the ground by means of hydraulic jacks.

A testing platform was then arranged so that the greatest weight rested on the end of the pile, which protruded several feet above the surface of the ground. The platform was then loaded with pig iron. Measurements that were taken from time to time showed that after about three weeks the pile had sunk to such a degree that despite the extreme length of the concrete shaft, this type of foundation could not be used in that particular site. Had the experiment shown that no sinking resulted after the shaft had been subjected to a test, about 1,500 piles of this nature would have been used in the construction of the building's foundation.

Lowering the Concrete Pile into Steel Bore, a Critical Stage of the Experiment

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It is understood that further experiments will be conducted for the purpose of determining the safest kind of foundation for the new post office.

ADVERTISING ON GERMAN PAPER MONEY

The blank space on German 100-mark notes is being made use of for advertising purposes by a German motor-car company in a manner designated as bold and ingenious. On a number of them this concern has printed the design of an automobile and an announcement to the effect that "whoever drives these cars saves many of these notes." Many people regarded the notes as spurious at first, and considerable excitement was caused in official circles, but as there is no law that forbids such treatment of the notes, nothing could be done to restrain the company.

German 100-Mark Note Bearing the Advertisement of a Motor-Car Concern

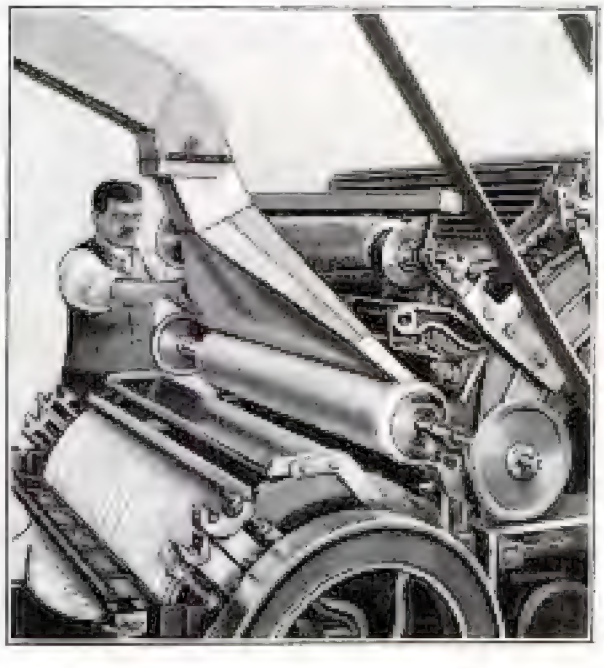
¶ The "Flower Express," a train which runs every day in the year between Toulon and Paris, carries nothing but cut flowers in baskets and pasteboard boxes for the Paris market.

PROTECTION FOR WORKERS IN COTTON MILLS

As dirt is damaging to spun yarn, giving the finished yarns and the cloth made from it an unclean appearance, naturally every means of eradicating it is employed in the great cotton-spinning mills, regardless of its being objectionable from a sanitary standpoint. But in cleaning the wires of the carding machines, which has to be done three or four times during the working day by workmen known as "strippers," much dust and fine fibrous matter is nevertheless liberated, forming dense clouds about the breathing area of the strippers. This involves serious risk to the strippers, and it is a well-known fact that a large percentage of these men have been found to be

Courtesy Cassier's Magazine

Simple Cotton Respirator Used for Many Years by Lancashire Cotton Workers



A Type of Dust Extractor Which may Solve the Dust Problem in Cotton Mills. Fan-Currents Draw the Dust into a Hopper and It is Carried Away by Pipes

A Scientific and More Effective Respirator is being Used to Some Extent

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more or less affected with lung and throat complaints.

The strippers, naturally, seek relief in any way obtainable, and for many years have adopted the simple plan of wedging a plug of cotton between their lips in the manner shown in one of the illustrations, in the hope of mitigating, to some extent, the effects of dust inhalation. This simple respirator has been used by hundreds of strippers in the cotton mills of Lancashire, Eng., but the more scientific and effective respirator shown in another illustration is now being used in some of the mills.

Complete elimination of the dust clouds, however, is the aim of the mill operators, as well as the removal of dirt and fibrous matter from the cards, not only as a protection to the workers, but as a means of obtaining still cleaner and finer yarns. To properly solve the problem, means must be adopted to catch the dust particles as near as possible to the point where the stripping brush impinges on the card cylinders, and in endeavoring to do this, a dust extractor of the type shown is being used. The dust is drawn into a hopper by means of fan-currents and is carried away through pipes. One hopper suffices for 20 or 30 cards, according to the length of the line of machines, the hopper being supported by a movable carriage running on rails attached to the dust trunk, which runs along the ceiling.

WORLD'S HIGHEST DAM TO BE BUILT IN IDAHO

BY L. WILLIAM THAVIS

Building the highest dam in the world, owning and operating a railroad, and creating the biggest reservoir in existence are three of the present activities of Uncle Sam. The railroad was constructed by the Reclamation Service. It is of standard gauge, 22 miles long and runs between Arrowrock and Boise City, Idaho.

The necessity for it was the same that has caused Uncle Sam to do many unprecedented things in connection with the big irrigation projects in the West. Many of these are located in the desert, and it is necessary for the government to build roads, telegraph and telephone lines, run hotels and department stores and, in this last venture, to build a railroad to get men and material to the scene of work.

The big dam that is being put in on the Arrowrock project in Idaho will be 351 ft. high and will cover an acre of ground. It is in a narrow section of the Boise Cañon, about 20 miles above Boise City. The site was selected only after long search. There were several drillings and pit diggings before bedrock was struck, 90 ft. below the surface of the river.

Four or five years will be consumed in construction. The top will be 25 ft. wide and 1,000 ft. long, with a roadway which will be protected by a parapet on each side. The dam itself will back up a lake of water that will irrigate 250,000 acres. When the reservoir is full, the water will be drawn off through gates near the top. As the level of the water is lowered, lower gates will be opened, so that these outlets never will operate under an excessive head of water.

The one place where there will be a maximum head will be the penstock that will be put in to run the turbines at the foot of the dam. There will be need for much electric light and power in connection with the dam itself, and a generating electric plant will be constructed so that it can be enlarged as desired for this purpose, and for the manufacture of electric power for sale. This is a feature that produces a steady income for several of the big irrigation works.

When the dam is full and there are floods in the Boise River, the capacity of the work may be taxed, and as a result there is a safety valve in the

The Site of the Arrowrock-Boise Dam, to Be the Highest in the World. White Line Indicates Height of Dam, 351 Feet above the River

Looking Downstream from the Site of the Dam, the Camp and Railway Bridge in Middle Foreground

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shape of a spillway at one end, capable of carrying 40,000 cu. ft. of water a second. It is thought this will more than take care of any normal flood in the river, but the dam is so built that, if necessary, water can waste over the top to a depth of from 2 to 4 ft. without injuring the structure itself.

HORSE DRAWS FUELLESS LOCOMOTIVE

The Raquette Lake Railroad, which traverses a forest section of New York state, used oil-burning locomotives even before the state passed the law compelling such locomotives for forest stretches. In the accompanying illustration is shown a horse hauling one of the oil-burning locomotives of this road to an oil-supply tank. Its supply of fuel had been consumed while still a short distance from the station.

Automobiles are Not the Only Vehicles That Have to be Towed by the Humble Horse

NEW CUBAN PROCESS OF SUGAR EXTRACTION

A new process of sugar extraction, being tested by a sugar factory in Cuba, is said to waste only one per cent of the sugar content of the cane. In this process the cane is first reduced to a fibrous pulp, which is dried and then treated by diffusion.

It is also claimed that by this method the residual pulp is, without further treatment, ready for immediate utilization in the making of paper.

ULTRAVIOLET-RAY STERILIZERS FOR ARMY

Uncle Sam proposes to safeguard the lives of his soldiers stationed at tropical posts against death by drinking impure surface water. This is to be done by sterilizing the water by electricity.

The statement is made by War Department officials that more American soldiers were killed in the Philippines by impure drinking water than by Filipino bullets. This is also true of the Spanish-American war. It has been found almost impossible to induce the soldiers to boil their drinking water and they have too often preferred to take chances of impurities of the surface water in the Islands rather than drink the flat boiled liquid. At last the medical corps officers believe that they have solved this important problem by a system of sterilizing the water with ultraviolet electric rays.

Strange as it may seem, drinking water can be purified more cheaply by electricity than by the universal method of boiling. At the same time the "live" taste of drinking water will be retained. All the microbes and death-dealing animalculæ can be destroyed by a single flash of the rays from an electric bulb.

The work of producing ultraviolet rays will be a very simple one at the army posts, most of which have electrical plants. For troops in the field it is proposed to furnish a small gasoline engine to run a miniature electrical plant. It is not the heat from the electrical bulb that kills the germs, but the ultraviolet rays.

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A Curious Swiss Coasting Sleigh Which Has Features Adopted Both from the Automobile and the Aeroplane

An ingenious coasting sleigh, which recently made its appearance at Davos, Switzerland, is described as combining the features of an automobile, a sleigh, and an aeroplane. It is designed for use on the long coasting slides in Switzerland, and the two sets of small wheels are so arranged that a lever raises them from the surface and drops the skids in position to carry the machine. When the coaster reaches the bottom of the slide and stops, the manipulation of the lever raises the skids and the machine returns up the grade on its wheels. The two planes or wings in front aid the pilot in steering during the trip downhill.

THE HUDSON RIVER AND OCEAN SHIPS

A project to deepen the Hudson River so that ocean vessels may ascend to Albany and Troy, 150 miles from the sea, is receiving considerable attention, and several of the consulting engineers on the New York State Barge Canal work, seem to be in favor thereof. The Federal government has already appropriated some $5,000,000 to provide broader channels, with a minimum depth of 12 ft., to Albany and Troy. Mortimer G. Barnes, one of the consulting engineers, estimates that by increasing this appropriation to $15,000,000, the channel could be deepened to 21 ft., with a width of 600 ft. to Staats Landing, and 400 ft. to North Albany; and that $21,250,000 would provide for an increase of depth to 25 ft.

With the river deepened to 25 ft., an ocean vessel could deliver its cargo to Albany, making, it is claimed, nearly as much speed as on the open ocean. There is, however, according to an article in the Engineering News, a doubt as to whether the deepened river would be extensively used by ocean ships. So far as traffic over the New York Barge Canal is concerned, when that channel is completed, barges coming through from Buffalo on the west, or Lake Champlain on the north, can pass down the Hudson River and discharge their cargoes at New York more cheaply than ocean vessels could go to Albany to meet them.

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A SOLITAIRE BASEBALL GAME ON MARS

It would be possible for a man to play a game of baseball alone on one of the two little moons of Mars, provided he could live there as well as he can on the earth. The possibility of such a game depends upon the fact that these satellites are only a few miles in diameter and that they have no atmosphere. Of course, it follows from the latter fact that the baseball player would be continually out of breath, but this circumstance will be neglected. Such a wonderful baseball game was recently outlined by Prof. F. R. Moulton, of the department of astronomy of Chicago University, in a lecture.

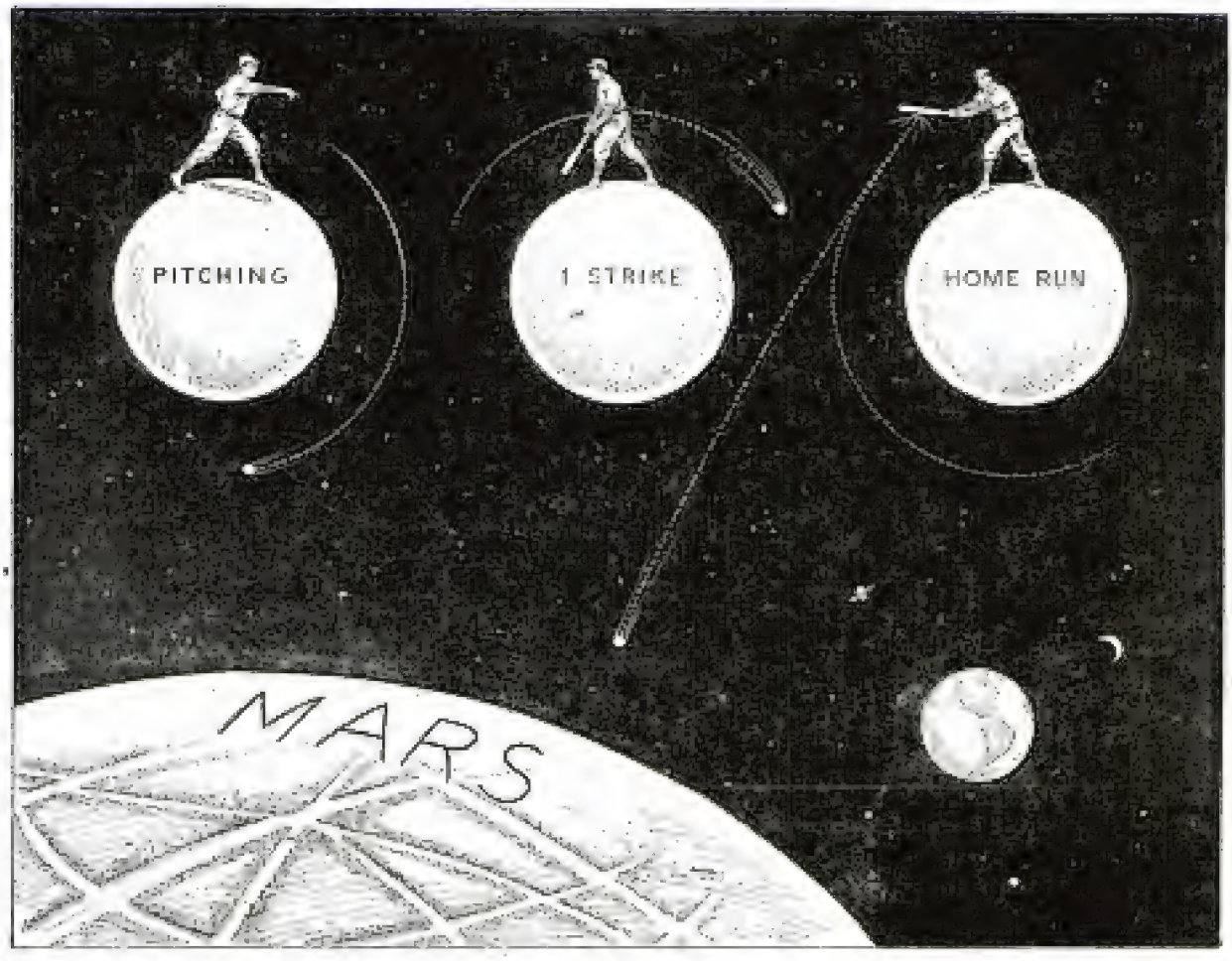
When a baseball player on the earth throws what we call a "swift ball," it leaves his hand with a velocity of, roughly, 100 ft. per second. The resistance of the atmosphere diminishes the speed of the ball and the attraction of the earth curves it downward. On one of the satellites of Mars the speed of the ball would not be diminished until it struck the ground, because there would be no air to retard it, and the ball would curve downward very slowly, because the attraction of so small a body is very feeble. A body dropped at the surface of the earth falls a distance of 16 ft. in the first second, while on one of these satellites its fall would be only one-fifth of an inch. Otherwise stated, a body which weighs one pound on the earth would weigh only one-sixtieth of an ounce on the satellites of Mars.

The baseball would be very light, but its inertia would be no less than it is here, and therefore the same amount of energy would be required to throw it with the same velocity. Consequently it must be supposed that the baseball player, who would himself weigh only one-fifth of a pound, could not throw the ball any faster than he can on the earth. But since the curvature of the ball downward would be very much less than it is here, he could throw the ball much farther there. In fact, it is found by computation that the curvature of the ball downward is less than that of the surface of the satellite, because so small a body has a strongly curved surface. This circumstance, together with the fact that the ball would not be retarded by an atmosphere, makes possible a solitaire baseball game.

The baseball player would start the game as a pitcher. After such preliminary motions as he might wish to make, he would throw the ball in a horizontal direction. There would be no use in giving it a spin, for there would be no atmosphere to make it curve. If he threw the ball anywhere near 100 ft. per second, it would go around the satellite, remaining continually at about the same distance from its surface, and would return directly over the point from which it was thrown.

In the meantime he would change himself into a batter and stand facing the direction from which the ball was coming; that is, opposite to that in which it was thrown. Unless his batting average were equal to that of Ty Cobb, the chances that he would miss it as it came speeding over the plate would be good. If he did miss it, it would go on around the satellite a second time with undiminished velocity, because it would not be retarded by an atmosphere, and he would get a second strike at it. If he took three strikes and missed each one, he would become a catcher while it was going around the fourth time. With a catcher's big mitt, he would catch himself out on its fourth return.

If he should succeed in hitting the ball, as baseball players sometimes do, and it were a grounder, it would go bouncing along the surface around the satellite; and during this time he would change himself into a second baseman or shortstop, picking it up on its return. This, of course, would not put the batter out, so he would throw the ball in a horizontal direction, when it would again go around the satellite and return to the first



Professor Moulton's Remarkable Method of Illustrating Atmospheric and Other Conditions on the Moons of Mars, Assuming That a Man Could Exist There—Which He Cannot—He would be Enabled, Because of the Lack of Atmospheric Resistance and Gravity, to Play a Game of Solitaire Baseball

baseman, which he would have become while it was gone. If, on the other hand, he should knock a fly, it would go round the satellite in such a way as to be far from the surface on the side opposite from the place of the player; but it would return exactly to the point from which it had been hit. While it was doing this, he would change himself into a center fielder and catch himself out.

It seems from what has been said that the batter would necessarily get out every time he came to bat. Of course, the first baseman might miss a throw and the center fielder might drop the ball. But there is another result possible in which he would not only not be out, but would score a home run. If he should hit the ball very hard, that is, about as hard as is necessary to knock a home run on the earth, he could not catch himself out, for the ball would go with such speed that the small attraction of the little satellite could not bring it back to its original place, and it would go down on the planet Mars. This would necessarily be regarded as a home run.

Every story, to be a good story, should have some point, and this story has a point. The atmospheres of the earth and other worlds are made up of little balls, called *molecules*, so small that it takes billions of them to make an ordinary baseball. These little balls are darting in every direction and continually hammering on everything which is in the atmosphere. Their continual bombardment makes the pressure of the air about 15 lb. to the square inch at the surface of the earth. Some of these little balls, or molecules, dart upward, but they are brought back again by the strong attraction of the earth. If one of the little satellites of Mars should have an atmosphere, molecules would dart upward

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from its surface with such a velocity that they would escape from its feeble gravitative control, just as the baseball did when the batter made a home run. They would pass to the planet Mars, or perhaps to some other world, and become a part of its atmosphere. This is the reason why small worlds, such as our moon and those which are still smaller, lacking in gravitative force, can not retain atmospheres and do not have any.

The Daughter of the Prime Minister of Denmark is Apprenticed to a Cabinetmaker

DAUGHTER OF STATESMAN TO BE CABINETMAKER

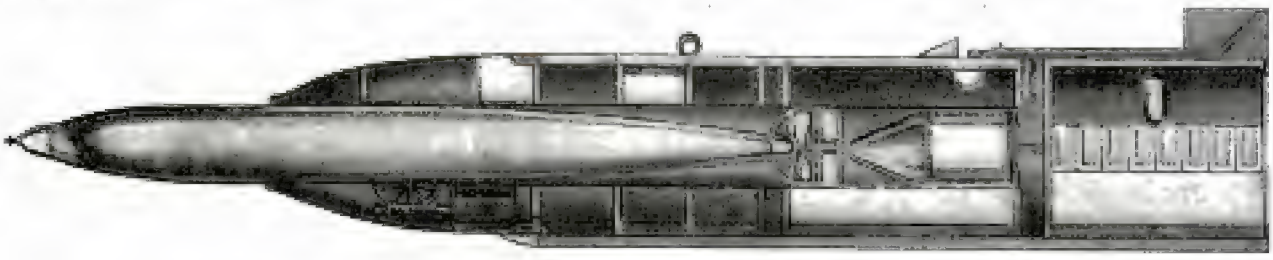
The seventeen-year-old daughter of the Prime Minister of Denmark has given up social life to apprentice herself to a cabinetmaker. Until her apprenticeship is over she will live the life of a simple working woman, but hopes some day to manage her own workshop, devoting her life to the making of artistic furniture.

Of the 50,000 passenger cars in use on the steam railways of the United States, 11,017 are electrically lighted, according to the report of a committee of the Railway Electrical Engineers' Association.

SUBMARINE THAT FIRES ITS BOW AT THE ENEMY

Construction is about to be commenced in San Francisco of a diminutive submarine having several ingenious features, invented by a retired major of the United States army. As shown by the plans, the little vessel, which is called an auto-submarine torpedo boat, is 45 ft. long, has a beam of but 43 in., and weighs only 9¼ tons, so that it may easily be carried on the decks or suspended from the davits of a battleship. It is driven by gasoline engines of 225 hp., and will have a speed of from 25 to 28 miles an hour on the surface.

In constructing such a small, one-man-operated submarine, the problem of carrying the torpedo was of particular importance. A torpedo that could be wholly carried within such a small boat would be too small to be effective, and the inventor therefore decided to use a standard-size torpedo, placed partially within and partially without the boat, making the longitudinal axis of the torpedo coincide with that of the



Showing the Size and Interior Mechanism of a Diminutive a Standard-Size Torpedo, at the Enemy; a Shoe, Engaging with

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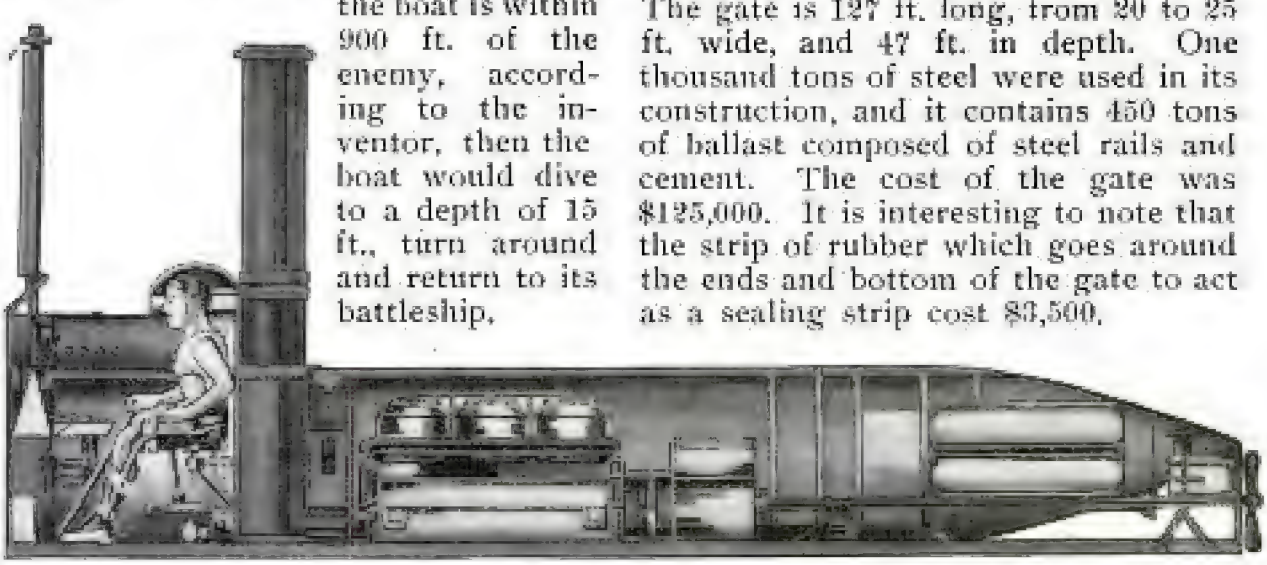
boat, and causing the forward third of the torpedo to perform the service of a bow until projected against a hostile warship. This is made possible by the use of a sort of shoe which the inventor calls a "sabot," and which is engaged by the tail of the torpedo. This sabot is operated by compressed air, and, when the air is released, is thrust forward, launching the torpedo and fixing itself in the bow of the boat as a plug, thereby forming a bow to take the place of the launched torpedo, and enabling the boat to be navigated back to its battleship.

The little submarine is designed to carry one man as crew. He sits in a conning tower which is hermetically sealed from all parts of the boat, and controls the vessel by means of operating mechanism in easy reach of his hands. The nose of the torpedo, of course, is not sensitized until it leaves the boat. The idea of the inventor is that such boats, to the number of five or ten, should be carried by each battleship, and that all should be discharged against a single target.

In making an attack, it is suggested that they run on the surface until within the sight-range of the enemy, then dip 5 ft. under the surface. At this depth they are still driven by the gasoline engines, but at lower depths storage batteries are to be used. The torpedo should be discharged when the boat is within 900 ft. of the enemy, according to the inventor, then the boat would dive to a depth of 15 ft., turn around and return to its battleship.



Submarine Designed to Discharge Its Bow, Which is Formed by the Tail of the Torpedo, Taking the Former's Place as a Bow

THE LAUNCHING OF A DRY-DOCK GATE

The large gate for the new drydock at the Bremerton Navy Yard, across the Sound from Seattle, was launched

Launching of the 127-Ft. Gate for the New Drydock of the Bremerton Navy Yard

recently at Seattle, sliding down the ways in the same manner as a ship. The gate is 127 ft. long, from 20 to 25 ft. wide, and 47 ft. in depth. One thousand tons of steel were used in its construction, and it contains 450 tons of ballast composed of steel rails and cement. The cost of the gate was $125,000. It is interesting to note that the strip of rubber which goes around the ends and bottom of the gate to act as a sealing strip cost $3,500.

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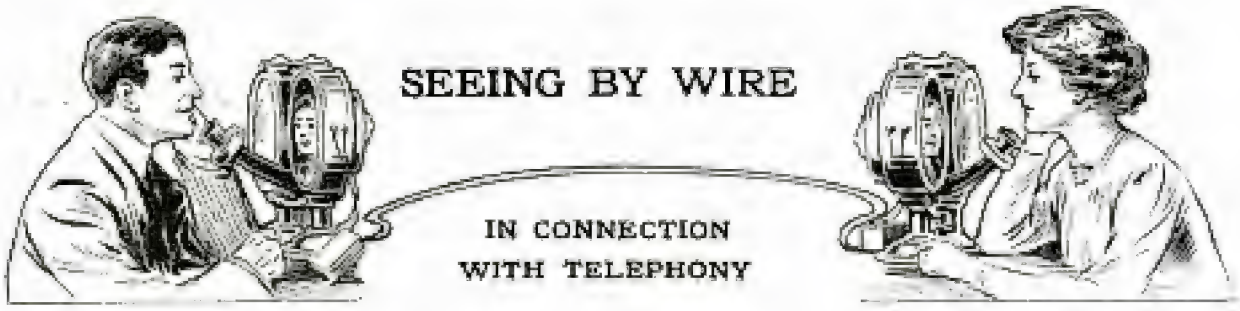

Though there are still many difficulties to be removed before seeing on the telephone ceases to be a problem, the realization by no means seems to be very far ahead.

Professor Rosing of the Technological Institute, St. Petersburg, taking advantage of the light-impressibility of a photoelectric element discovered by him, has invented what he calls a "phos-telephonic" system (from the Greek word "phos" meaning light), which is a remarkable approximation to the final achievement. Two other scientists, Drs. Elster and Geitel, have even gone a step further; for they have discovered an element which, apparently, is more susceptible to the impressions of light than Dr. Rosing's "phos-electric" element. Considering these facts, it is not unreasonable to expect the last and crowning success within a comparatively short time.

When a person stands before Professor Rosing's instrument and opens the circuit by taking the receiver off the hook, a small luminous pencil begins to draw his likeness on a dark screen, and in the twinkling of an eye the work is complete. His visible counterpart is there, and is rapidly transmitted to the sight of the person with whom he is speaking. So it is with the person at the other end; his image is traced on a screen and is transmitted to another small screen.

How is this done? Two systems of mirrors are moving in such a way as to cast the image upon the phos-electric element inside the transmitter. An ingeniously made vacuum tube sends out fine rays, not seen by the eye. These rays, falling on the screen, cause a certain part of it to appear very bright—that part where the image is—and an electric current transmits the image to the screen of the second person, wherever that person may be. He sees the sudden brightness on the screen, and also the lifelike photograph—the miniature of the person to whom he is speaking.

The manner in which the mirrors move must be taken into account. By their movement they cause the light on the screen to accord exactly with the light rays reflected from the speaker's body. The image is thus transferred by the mirrors to the phos-electric element, in which is thereby excited an electric current that carries the image to the screen of the second person. All this is done instantaneously and being continuously repeated, causes the photograph to remain on the screen until the speaker withdraws, in the same way as moving pictures are possible through the cinematograph.

As the Rosing apparatus is yet in its infancy, only very small objects can be seen with it. But, considering the idea behind the invention, and in view of the favorable opinion of a celebrated expert, we may reasonably expect to have the final happy result at no distant date. To see a person while speaking to him on the telephone, will soon be a very familiar circumstance.

MOST POWERFUL WIRELESS STATION

The wireless-telegraph station at Coltano, Italy, recently constructed by Marconi, is said to be the most powerful now in existence. It disposes of a transmitting power of 1,000 kilowatts (1,340 hp.) and its antenna contains about 3,300 ft. of wire. With this equipment it is expected that connection will be easily established with North and South America.

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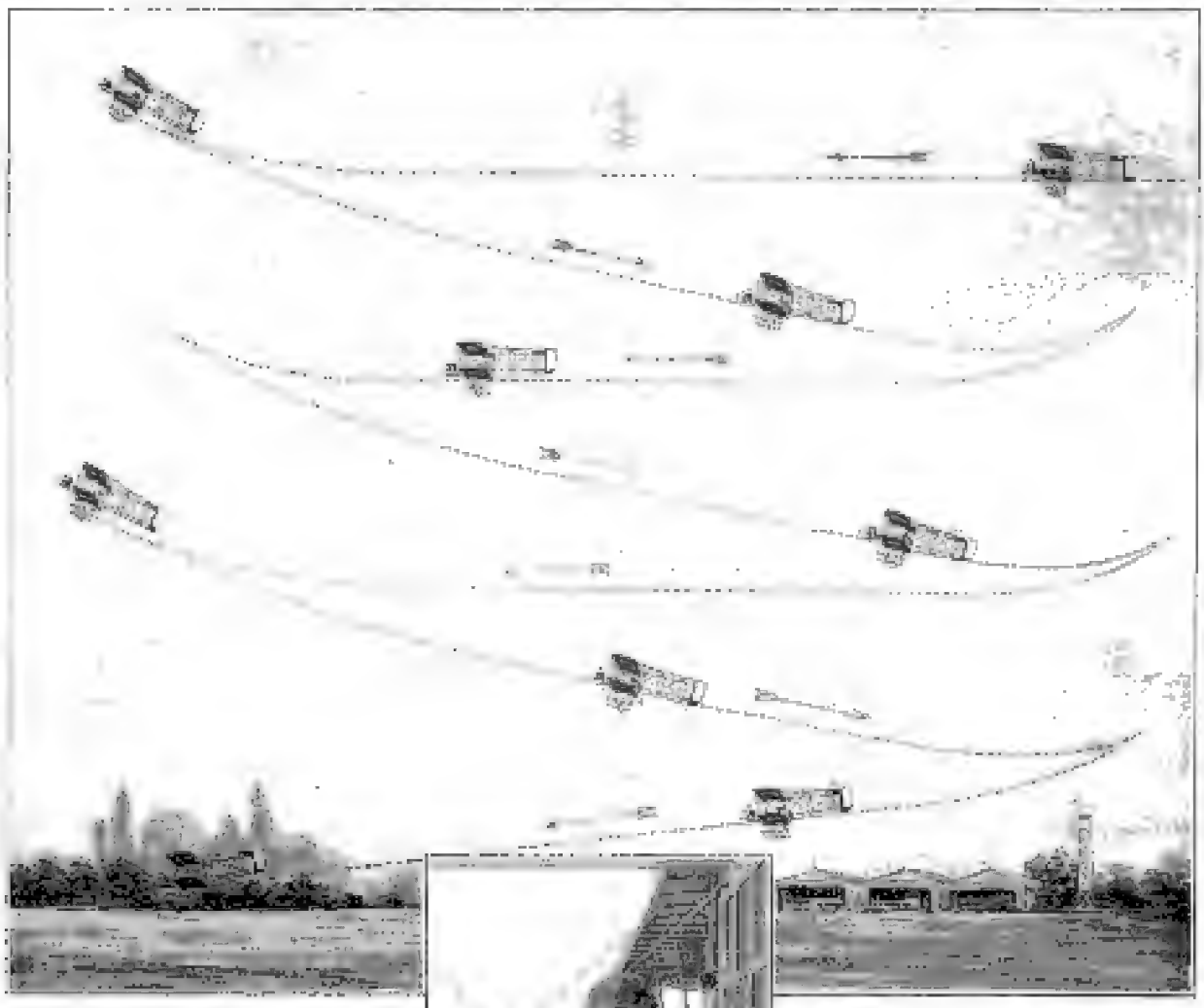
AEROPLANE BACKS DOWN, SWINGING TO EARTH



How Legagneux, the French Aviator, Executed His Latest Feat, Backing Down in Long Swings

Insert Shows This Pilot about to Start a Flight in the New Bleriot Aeroplane-Bus

The latest aviation stunt, news of which has just come from France, is the feat illustrated herewith, and in the performance of which it is stated that Legagneux, first famous as a bicycle rider and afterward known to two continents as an automobile racer, has attained great proficiency.

On the occasion of his most sensational execution of this new aerial maneuver, Legagneux is declared by various French army officers and other credible witnesses to have first ascended to a height of over 3,500 ft. Then, driving his machine on a horizontal course, he shut off the motor, steered momentarily upward, and as soon as all momentum and forward movement were lost, permitted the machine to back down an incline in the air for a distance of several hundred feet. This accomplished, another movement of the horizontal rudder tilted the machine into a position for diving forward, the motor was switched on, and travel in a normal direction, on a level course, resumed. A succession of these evolutions, with the machine swinging backward and forward, like the bob of a giant pendulum, and the ground was reached.

Interesting though such a flight may seem, as attesting the completeness of man's conquest of the air, it contributes

An American Locomotive, One of the Most Powerful Ever Built for an Eastern Railroad, Which is 98 Ft. Long, Including Tender, and, with the Loaded Tender, Has a Weight of 668,900 Lb.

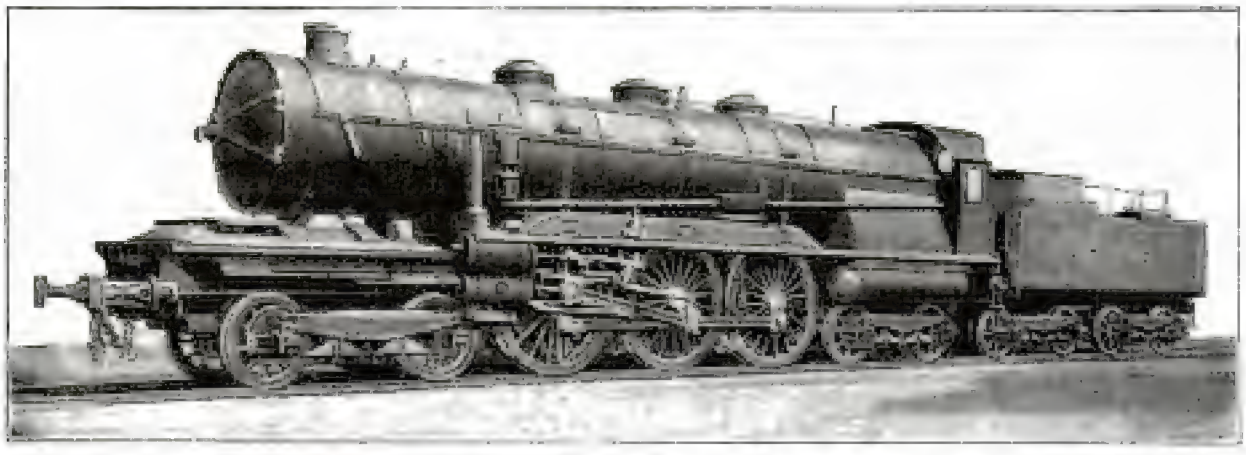
little of value to engineering progress, because it can be accomplished only with the inefficient types of sustaining surfaces, so little specialized for ideal use that they will operate about equally well in either direction.

From the safety standpoint, such performances are even more to be condemned, since every fatality added to the present list in aviation does not affect merely the man foolish enough needlessly to risk his own life. There is in addition the injury to the future of a great industry, which at the present time is all too widely and vigorously denounced as a dangerous pursuit, with little consideration of the fact that many reckless but ignorant men, wholly incompetent except as mere aerial chauffeurs, are seeking large returns as aviation hippodrome artists by taking the most reckless and dangerous chances imaginable, chances that can have practically no bearing upon nor relation to saner flight.

POWERFUL AMERICAN AND EUROPEAN ENGINES

One of the locomotives shown in the accompanying illustrations was built for the freight service of the Pennsylvania Railroad system, and while smaller and less powerful than the huge mallet type of one of the western railroad systems, is one of the most powerful used on eastern roads. Including the tender, it has a length of 98 ft., and, with the tender loaded, the total weight is 668,900 lb.

The other illustration shows the most powerful passenger-train locomotive in Europe. It is a 4-cylinder compound superheater locomotive used to draw the Nord Express, connecting Paris with Brussels. Drawing a train of 400 tons' coach load, this locomotive attains a speed of 75 miles per hour, developing about 2,000 hp. in the cylinders. The total weight, with tender loaded, is 317,000 lb.



The Most Powerful Passenger Locomotive in Europe Weighs 317,000 Lb., Including Loaded Tender, and Draws the Nord Express at a Speed of 75 Miles per Hour

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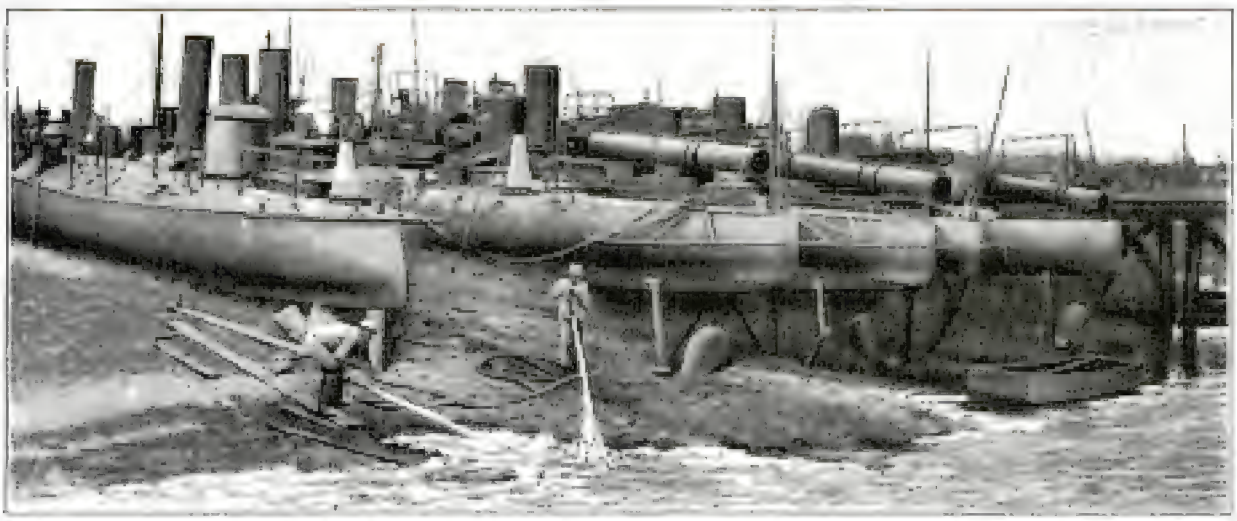
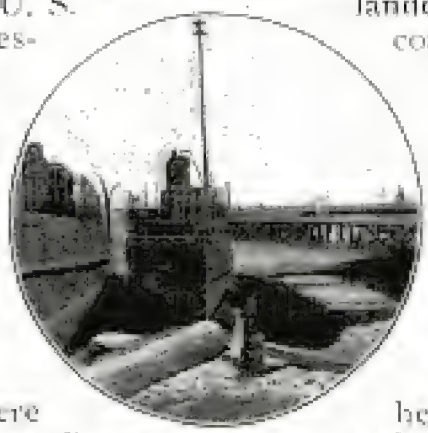


The Five Torpedo Boats "Hurricaned" into the Mud at Charleston, S. C.; at Work Flushing Channels for Them with a Hose

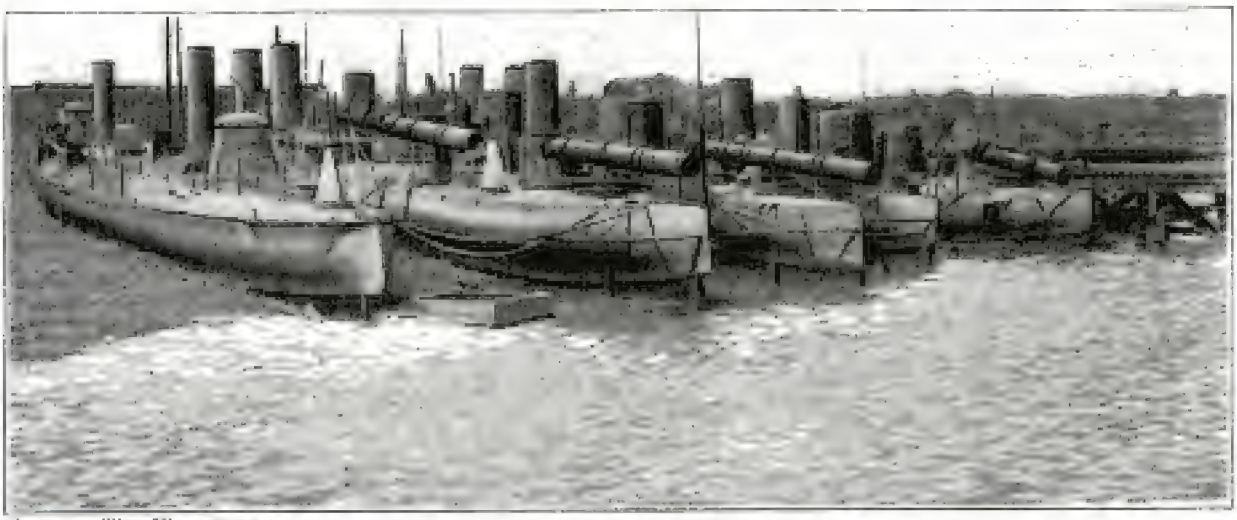
STRANDED TORPEDO BOATS FLOATED WITH A HOSE

One of the most unique floating feats ever accomplished in the U. S. navy took place at Charleston, S. C., after five of the torpedo boats of the reserve torpedo division had been driven clear out of the water and stranded in the mud by a hurricane which struck that section of the country a few months ago.



The "Dahlgren" being Dragged Back into the Water

The boats, which were the "Cushing," "Dahlgren," "Biddle," "Craven" and "Barney," were driven ashore in a parallel column, as shown in one of the illustrations. The mud in which they landed was covered with a coating of heavy marsh grass in which it was practically impossible to use a spade, so the expedient of using a high-pressure hose to float the vessels was adopted with success. Power was furnished by the "Worden," which had not suffered the fate of her companions, and, one at a time, a channel was excavated for each boat. Then cables were attached and the little fighters again dragged back into the



Courtesy The Fleet Review

The Little Sea Fighters High and Dry in the Mud as Viewed from the Water

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water. It was necessary to drag each boat about 100 ft. before it became waterborne, and it required about 150 tons' pull to even budge them.

The refloating was accomplished without the slightest damage to either the hulls or machinery, and with but one mishap. A tackle carried away once, injuring one man, but not seriously.

AUTO MAIL TRAIN USED IN NEW MEXICO

The auto mail stage line, which has been in operation for six years in the Pecos Valley of New Mexico, has an interesting auto mail train running between Roswell and Vaughn, a distance of 110 miles. Attached to an automobile of the touring type is a special mail-carrying trailer which stands about 40 in. high, is 9 ft. long, and weighs 550 lb. Its capacity is 1,550 lb. of mail. A waterproof top protects the mail from damage by rain. The car drawing the trailer is reserved for passengers.

An Automobile Mail Train, Consisting of a Touring Car and Trailer Carries Passengers and Mail in New Mexico

LIGHTS IN FLOOR MARK SEATS IN THEATER

A motion-picture theater in Portland, Ore., has installed green lights in the floor, beside every row of seats, so that a person entering after the beginning of the show can find a seat without groping about in the dark. The device is merely a slot cut into the floor to hold the light, with a piece of thick glass over it.

LOVE LETTERS MADE INTO WALKING STICK

A unique and ingenious way of disposing of love letters and yet have them always at hand, although in a form which makes reading impossible, was devised by a seaman of the British navy, who converted the letters written to him by the young lady who is now his wife into a "sentimental" cane.

The love letters made into a cane by this sailor numbered 1,000, about 150 of which were received after his marriage. In making the cane he first procured a ¼-in. steel rod and threaded it throughout its entire length to receive a nut. Then he cut the letters into portions an inch square, pierced a hole in each square, and thrust several of them at a time on the rod, in the manner of filing receipts. After putting a certain number on the rod he compressed them by screwing up the nut with a hand-spanner, and, when they were sufficiently compressed, removed the nut, placed more on the rod, and repeated the operation until the whole stick length was finished. He then cut off the rough edges with an old razor, chipped the paper into a tapering form with a chisel and hammer, and finally obtained a perfectly smooth surface with an ordinary plane. The final touches included the varnishing of the surface, and the placing of a metal tip on the small end and an ebony handle on the other.

One of the artistic features of the completed cane are the grey rings in it at intervals of about an inch. They represent the letters written on grey

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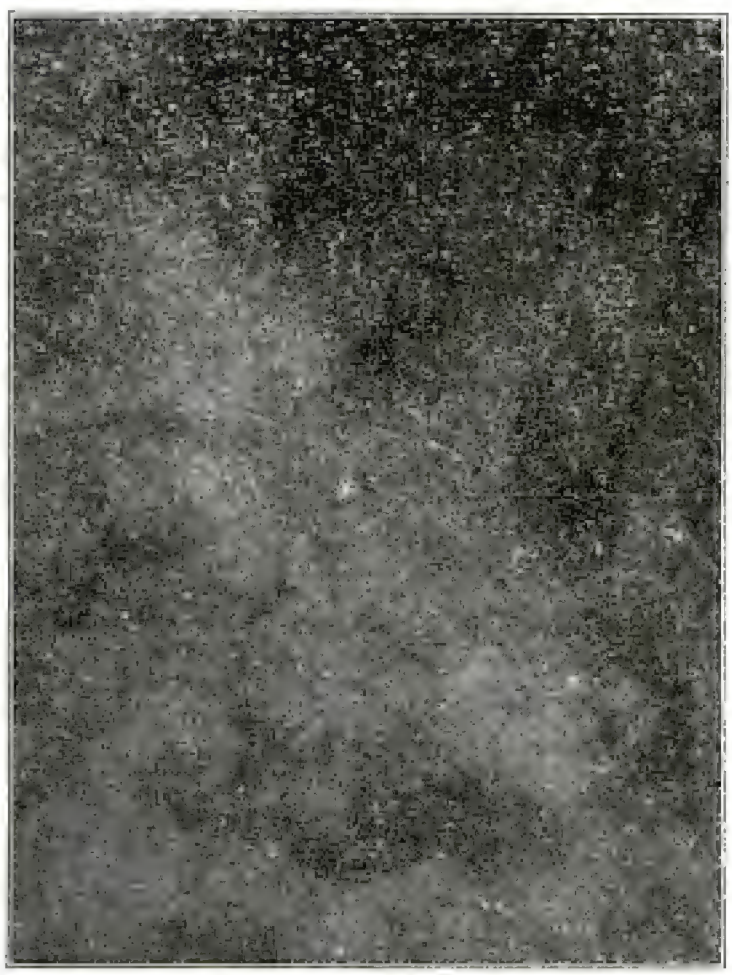
paper by the seaman's wife during the year after their marriage. The cane is exceptionally strong and formidable, and looks very much like a Malacca stick.

THE LARGEST UNIT OF SPACE IN USE

Scientists use a unit of space depending upon the magnitudes of the things with which they are dealing. If they are interested in very small things, they use the cubic centimeter or cubic inch. If they are engineers, engaged in making excavations such as the Panama Canal, they use the cubic yard. If they are geologists, considering the volume of the continents and oceans and how the continents are washed into the oceans, they use the cubic mile.

The largest unit in use by scientists is that which astronomers employ when they measure the celestial spaces. Their unit of volume is a sphere whose radius is 200,000 times 100,000,000 miles. The volume of this unit is approximately the radius cubed and multiplied by 4. The number of cubic miles in this unit is therefore represented approximately by 3 followed by 40 ciphers.

Obviously, the reason astronomers use such an enormous unit of space is that the volumes with which they deal are very great. But one might ask if this unit is not much larger than is necessary. Indeed, it is scarcely thinkable that it would not include the whole universe. If such a sphere were constructed with its center at the sun and its surface out in every direction to the distance of 200,000 times 100,000,000 miles, one might ask if it would not contain within its limits the North Star, the Pleiades, the Milky Way, and all the other stars that fill the sky. The astonishing answer to this question is, however, that there would not be another star in it besides the sun. Most of them are hundreds of times as far away from us as the surface of this immense sphere would be. The appalling magnitude of the universe is indicated by the fact that there is, on the average, but one star in seven or eight of these enormous units of space, though through the great modern telescopes the stars seem literally to fill the sky.



Great Star Cloud Photographed by Professor Barnard. Here Where the Stars Seem Crowded Together Like Flakes of Snow in a Drift, There is Only One to Seven or Eight Spheres Whose Diameters are 400,000 Times 100,000,000 Miles

GERMAN MOTOR-ROAD IN AFRICA

Germany's new West African territory, obtained from France in the settlement of the Morocco dispute, is, according to reports, to be linked up with her East African colony by a service of motor cars across the continent,

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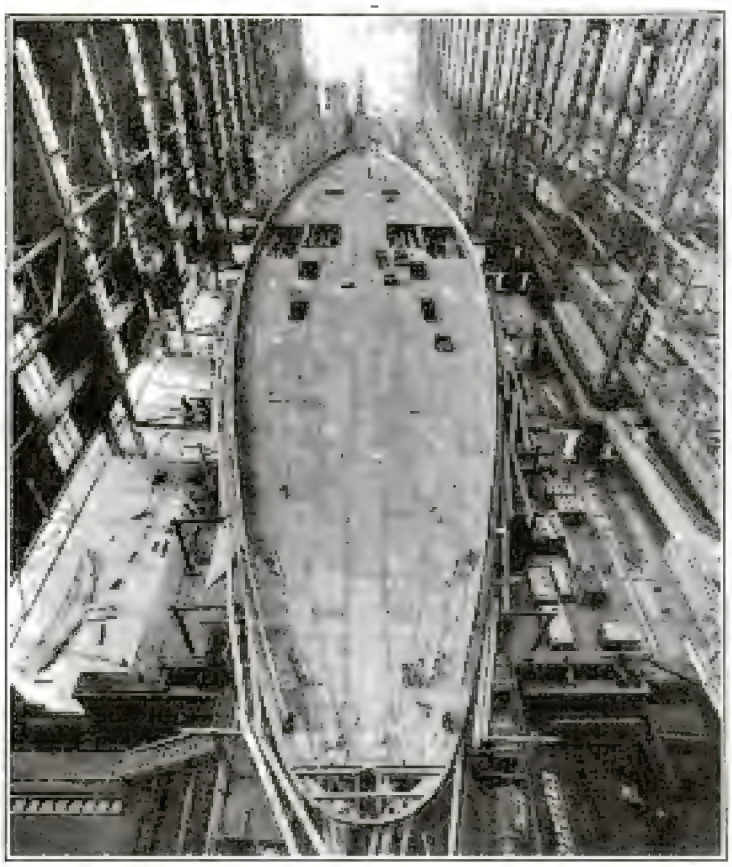
passing through Belgian Congo. A corps of German engineers and military officers are already surveying the ground and studying the best route. New roads will have to be hewn out of mountains and through forests, and many bridges will have to be constructed across rivers.

The idea of a motor-car service is the result of the success of this means of communication and transportation between districts in Belgian Congo.

FERRYBOAT SHIPPED IN SECTIONS BY RAIL

A rather unusual transportation method was adopted recently by the New York Shipbuilding Co. in delivering a large ferryboat from Camden, N. J., to San Francisco. She was built on the "knock-down" plan and shipped by rail, 35 cars being required for transporting her.



The "Knock-Down" Ferryboat, Built to be Transported by Rail, as She Looked on the Ways Fully Bolted Up and Ready to be Delivered

The extreme length of the boat, which is a side-wheeler, is 292 ft., and her beam, over guards, 75 ft. She contains 850 tons of steel. Her carrying capacity is 4,000 people, and she has a seating capacity of 2,000.

SIR OLIVER LODGE WARNS ELECTROCULTURISTS

Many attempts have been made in the past, and are still being made, to supply electricity to a network of wires placed over a field by means of elevated spikes, arranged so as to absorb the electricity of the atmosphere with the end in view of thus stimulating plant growth.

Sir Oliver Lodge, the English scientist who was the first to make extensive tests to determine the practicability of electroculture, utters a word of warning in a letter to Nature with regard to attaching too much importance to negative results obtained by such supposed electrification of wire network over a field, unless there is reasonable guarantee that the network is really kept positively electrified during considerable periods. He says that singularly perfect insulation would be required to enable electricity slowly supplied in this way to accumulate until a fizzing point was reached, and that the attainment of such a potential over a large area is quite impracticable except when a thunder storm is passing overhead.

The same difficulty of adequate insulation has also militated against many attempts made in the past to supply electricity from artificial but old-fashioned high-potential sources, especially when the area to be supplied extended over many acres. According to Sir Oliver Lodge, any metallic network not really charged, but kept practically at zero po-

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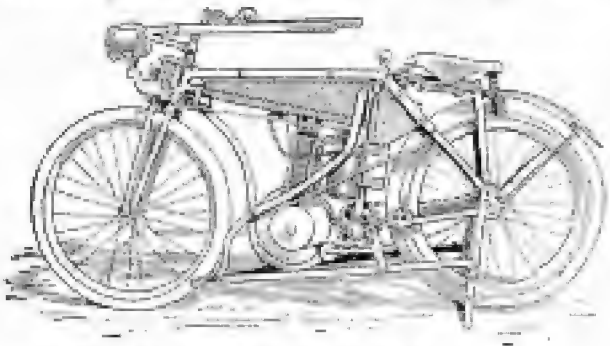
tential by leakage to earth, would be rather detrimental than otherwise to the growth of plants beneath it, as it would tend to screen them from inductive electrification by the electricity of the atmosphere, which is a natural process in plant life.

DOUBLE-GAP SPARK PLUG

A spark plug, which has two gaps, thus producing two sparks, has been placed on the market by an English concern and is meeting with much favor. Simultaneous sparks are given at both gaps. Should one gap become sooted, sparking continues at the other, and the continued explosions tend to clean the dirty points automatically.

LEVER-OPERATED MOTORCYCLE STAND

A motorcycle stand, raised and lowered by means of a hand lever, has been patented by an inventor of Chatham, Mass. It is shown attached to a high loop-frame old-style machine, the saddle of which has been brought low enough for the rider to stand over it, with his feet on the ground. After starting the engine, the rider presses forward on the hand lever, thus throwing the stand in its inoperative position, the revolving drivewheel comes in contact with the ground, and the machine starts under momentum. The brake-shoe attachment of the stand rests against the lower part of the front



Lever-Operated Stand Applied to Old-Style High-Framed Motorcycle

tire when the stand is in operative position, and is designed to eliminate most of the jar incident to the use of the ordinary stand.

MONUMENT TO LOS ANGELES DYNAMITE VICTIMS

The monument erected in Hollywood cemetery, near Los Angeles, to the memory of the 20 men killed in the

Monument Erected in Hollywood Cemetery, Los Angeles, to the Men Who Were Killed by the Dynamiting of the Los Angeles Times Building

dynamiting of the Los Angeles Times building is shown in the accompanying illustration. The base stone weighs approximately 22,000 lb., and the main die, upon which the larger of two beautifully inscribed bronze tablets appears, weighs 12,000 lb. Above this tablet die rises a rocky crag-like mass of granite, upon the high projecting end of which is perched a bronze eagle. An imposing figure, (not in place when the photograph was taken) stands upon a pedestal at the foot of the base, half facing the main tablet. This tablet tells the purpose of the monument, and bears a eulogy and the names of the men who lost their lives.

¶What is said to be one of the strongest searchlights in existence has recently been placed on the roof of the Bank of International Pensions, Montevideo: The candlepower is said to be 90,000,000, and the light can be seen 11 miles and illuminates every portion of the city.

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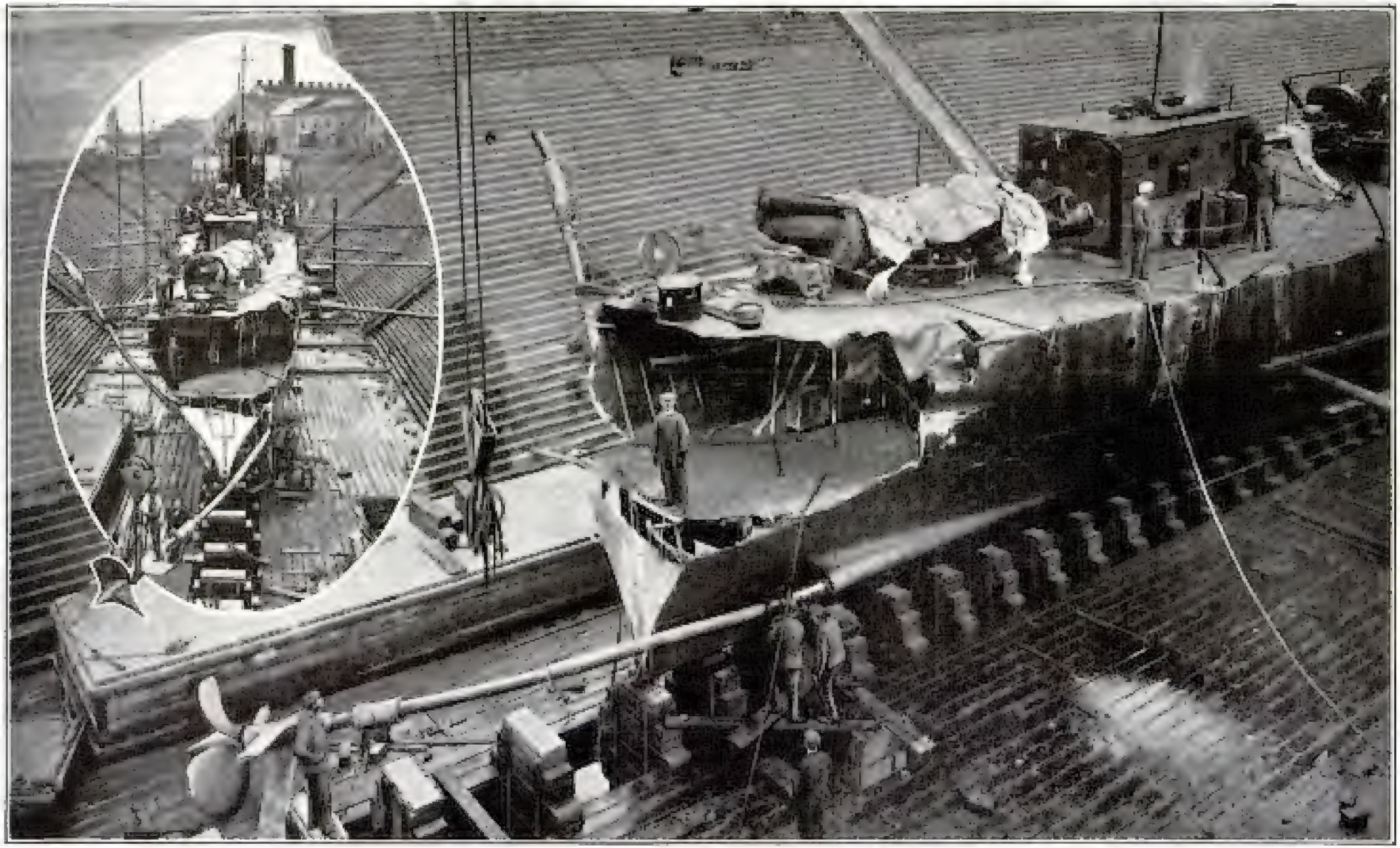

The Torpedo-Boat Destroyer "Warrington" in Drydock at Norfolk, Va., Showing How the Schooner Ripped Her Stern Away—
The Smaller View Shows How the Propeller Shafts Were Twisted

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THE REMARKABLE ACCIDENT TO THE TORPEDO-BOAT DESTROYER "WARRINGTON"

"Nothing like it ever happened before to any ship in the world."

Such is the comment of Rear Admiral Hutch I. Cone, chief of the Bureau of Steam Engineering, of the Navy Department, on the remarkable accident which befell the U. S. torpedo-boat destroyer "Warrington," which was struck by an unidentified lumber schooner at one o'clock on the morning of Dec. 29, when on her way from Charleston to Norfolk.

As shown in the photographs reproduced on the opposite page, more than 25 ft. of the stern of the destroyer was sliced off in the collision, yet the little vessel survived, unaided, until the cruiser "Salem" came out from Norfolk and towed her to the drydock. The coolness and bravery of her crew saved the ship from sinking then and there. Watertight compartments were quickly closed, and the middle and forward portions of the vessel saved from being flooded with water.

Six men were sleeping in the compartment shown torn open in the pictures when the collision occurred. Thrown into a corner by the impact, upon this rude awakening, they saw the black waters rushing in upon them, and saw the sky above them where a moment before had been a steel deck. Two of the men clambered out over the rushing waters, upon the jagged steel side, and to the deck above. To this day they cannot remember how they accomplished this almost unbelievable feat.

The other four escaped into the next compartment, but were unable to close the watertight door. With the seamen in that compartment, they rushed into the next, and succeeded in closing the door, thus saving the lives of all on board, and the ship.

With propeller shafts hopelessly bent, the "Warrington" wallowed in the heavy seas while wireless calls for aid were sent out. The revenue cutter "Onandaga" was the first to respond, taking off the majority of the crew. The rest, with the officers, stuck to the ship until it was brought to the Norfolk yard by the "Salem."

Preliminary estimates place the cost of repairing the damage at $50,000. The stern will have to be entirely rebuilt, and new propellers and propeller shafts installed.

A PORTABLE ELECTRIC MOTOR FOR GENERAL FARM WORK

The extreme convenience of electricity as motive power for the many small machines used in agricultural work has not, as yet, been fully recognized. The cost of installing and maintaining numerous small motors, each of which is in use only occasionally, is one of the chief hindrances, but one which would soon disappear if the custom of employing a single portable motor for all the miscellaneous work of the farm became more general.

A motor suitable for such work has been recently brought out by a foreign firm. The motor which is of the semi-inclosed type (of from 2 to 6 hp., according to the work to be done) is mounted on a light angle-iron frame supported on two wheels. Two long handles are provided at one end of this two-wheel truck to aid the operator in moving it. The breadth between wheel centers is only about 17 in., so that it can be drawn along the narrowest paths or passages. The weight is so distributed that only about 50 lb. fall on the handles. The motor is provided with ample pulleys and gearing, enabling belt speeds ranging from 102 to 1,950 ft. per minute.

A portable machine of this type is obviously readily applicable to work of the most varied kinds, including the driving of threshing machines, sifters, chaff-cutters, winnowing machines, crushers, sewage pumps, wine presses, mills, hoists, band saws, circular saws, and in fact, practically any of the machines met with on a farm.

Revolving-Arm Automobile Washer with Electric Light

ILLUMINATED CAR WASHER FOR THE GARAGE

An ingenious means of specially illuminating an automobile while it is being washed, is shown in the accompanying illustration. The water-supply pipe enters the garage through the ceiling, and to it is attached a revolving arm, one end of which carries the hose. Mounted near the same end of the revolving arm as the hose is a powerful electric lamp which throws a stream of light downward on the part of the automobile being washed. As the arm can make a complete revolution, a short length of hose will suffice to reach all parts of the automobile with the spray of water.

CAR DEVICE TO ANNOUNCE STREET NAMES

A Chicago street railway company has, for experimental purposes, equipped a number of its cars with a new device which is intended to do away with the opening and closing of the door by the conductor in order to announce the names of streets. This device is really a loud-speaking telephone and consists of a specially constructed telephone transmitter and what the makers call a "reproducer." The reproducer takes the place of a receiver in the ordinary telephone circuit, but its construction is quite different and it is many times as powerful. When used in street cars, the reproducer is mounted in combination with two horns, and the combination is then supported from the ceiling of the car, the horns pointing toward the forward and rear ends of the car. A number of these reproducers can be connected in multiple, and all be operated by the same transmitter.

The transmitter itself is of special construction and it is mounted on a handle, the electrical connection being made through well insulated, flexible conductors bound into one cord.

When not in use, the transmitter is hung on a hook within easy reach of the conductor. The conductor removes the transmitter from the hook when he desires to announce the name of a street, and speaks directly into it, thus eliminating to a great extent the disturbances due to the vibration of the car that would occur if the transmitter were fastened rigidly to the car. The current used in operating the enunciator is taken from the trolley.

By Calling the Names of Streets through a Loud-Speaking Telephone Outfit, the Necessity of the Conductor Opening and Closing the Door as Each Street is Approached is Done Away With

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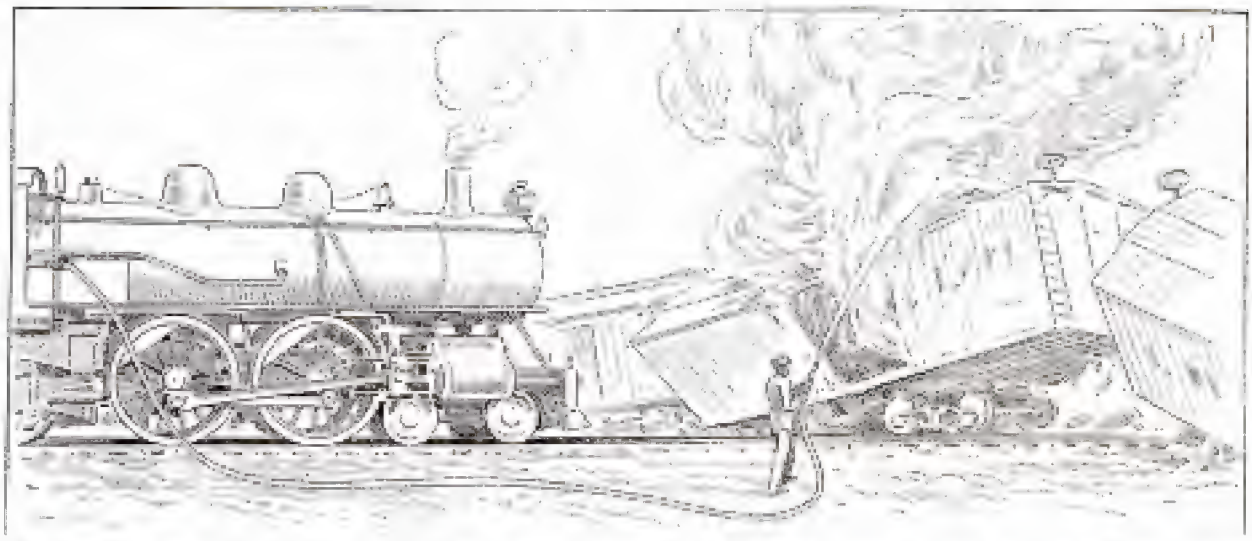


Fighting a Freight-Yard Fire with the Water Carried by a Locomotive. A Simple Three-Way Valve Placed in the Feed-Water Pipe between the Injector and the Boiler, and 50 Ft. of Regulation Steam Hose Convert the Locomotive into a Fire Fighter

LOCOMOTIVE FIRE EXTINGUISHER

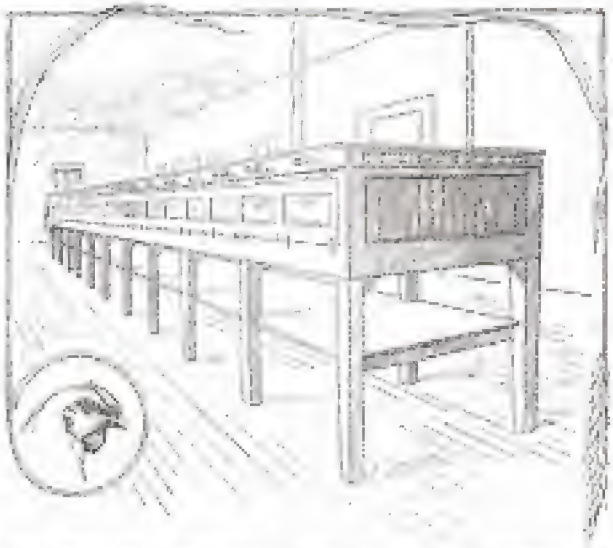
An ever ready and ingenious fire-fighting apparatus, which is applied to locomotives, has recently been tested out by the Missouri Pacific railway at the Ewing Avenue shops, St. Louis, Mo., to the satisfaction of the fire chiefs of that city and the officials of the road. It is simply a three-way valve placed in the feed-water pipe of the locomotive between the injector and the boiler. A regulation steam hose, about 50 ft. in length, is used for the fire hose and is kept on a reel under the running board of the engine.

It was found necessary to use the regulation steam hose, as an ordinary fire hose would soon be destroyed on account of the hot water coming from the injector. The water tanks of the ordinary yard engine hold about 6,000 gal. of water, and the idea is that when the engine reaches the scene of a fire in the yards, the switchman is to jerk the hose from the reel and attach it to the valve connection in the feed-water pipe and pull the hose to the fire. Meanwhile the engineer is to start his injector while the fireman gets on to the running board and opens the connection to the fire hose.

¶A chair in aeronautics has been established at the Polytechnical College, Vienna, Austria.

ELECTRIC INCUBATOR HAS 6,000-EGG CAPACITY

One of the largest electric incubators in use anywhere in the world was built for a poultry raiser in New Orleans. It is 40 ft. long by 5 ft. wide, and contains 40 compartments, each having a capacity of 150 eggs. Each compartment can be separately controlled, so that any one, or all of the compartments, can be operated, according to the number of eggs to be hatched. The controlling thermostats used do not completely break the



This Electric Incubator, Located at New Orleans, is 40 Ft. Long and Has a Capacity of 6,000 Eggs

heater circuit, but introduce the comparatively high resistance of a small electric lamp when open, thus avoiding sparking at the contacts.

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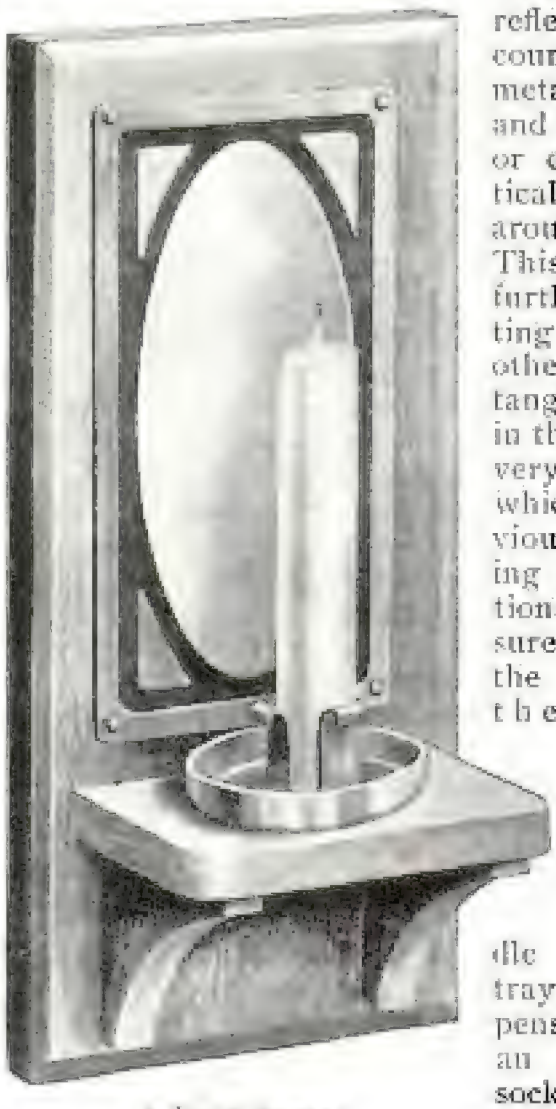
METAL WORK AND ETCHING

By JOHN D. ADAMS

PART VI—Candle Sconce and Whisk-Broom Holder

ALTHOUGH the woodwork may seem to be the most conspicuous part of this candle sconce, it will, in reality, occupy but a small portion of our time. There are four pieces of wood; viz., the back, the shelf and two brackets, all of which may be readily prepared by anyone who can make fair use of the saw and plane. A little care will be necessary to have the four edges beveled off to exactly the same extent. Nail the shelf in place and then the brackets, setting in all nails from behind and supplementing them with a little glue. Stain as desired, and then thoroughly rub with wax.

A suitable little brass or copper pan to catch the drippings can usually be picked up at the stores; if not, one must be hammered up from a disk of the metal duly softened. Gradually work the edge over, turning the disk slightly between each stroke of the hammer. To hold the candle, we must prepare two strips about 3/8 in. wide and 5 in. long, each of which is bent U-shape and riveted to the bottom of the metal drip pan. By this means we provide four upward-projecting pieces, which may be adjusted by bending so as to firmly hold the candle.



A Candle Sconce

The back plate or reflector should, of course, be of the same metal as the drip pan, and may be left plain or else have an elliptical strip etched around it as shown. This feature may be further varied by cutting the sheet in some other form than the rectangular. The etching in this case will prove a very simple matter, and whichever of the previously described coloring or oxidizing solutions is employed, be sure to have at least the central portion of the reflecting plate rubbed up bright and evenly lacquered.

If it is desired to make an electric-candle sconce, the drip tray should be dispensed with and an ordinary electric socket set up in place. This should then be completely boxed in with thin pieces of wood, through which the operating key will project. The top of this small concealing box should not be less than

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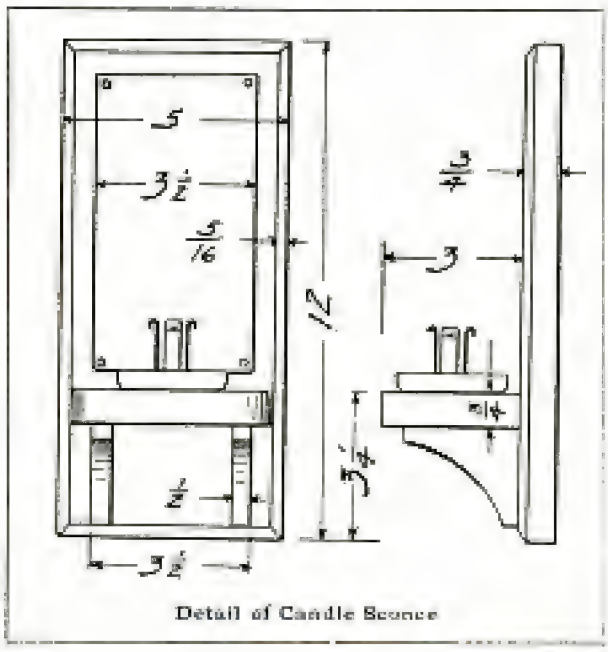
¼ in. thick, and project over the sides by a like amount. A central hole is also to be cut therein to allow the frosted electric candle to be screwed into the socket.

Whisk-Broom Holder

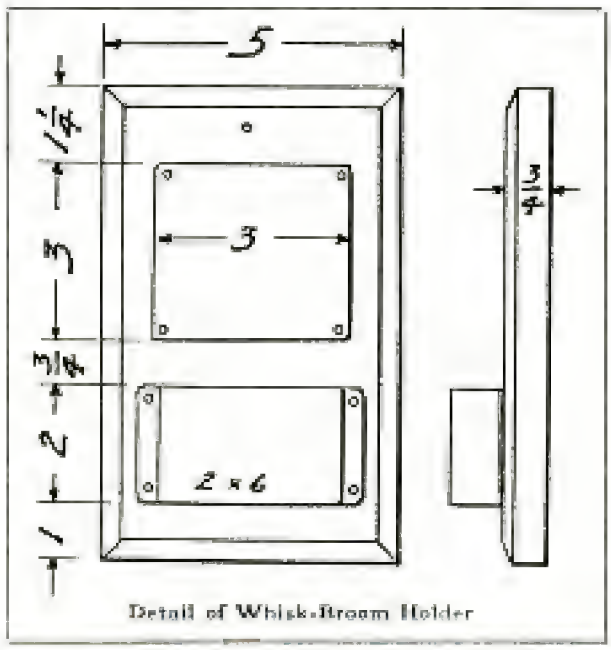
Another of the many attractive household articles that may be made at the cost of a few cents is the whisk-broom holder. In the design illustrated, the back board has beveled edges and bears a brass or copper plate etched with a simple design, under which is fastened a bent strip of the same metal to hold the broom. If desired, the metal plate may be replaced with a match holder or even a small mirror, in which case the etching will be confined to the strip that holds the whisk broom.

Whisk-Broom Holder

A sufficient number of these household articles have been described and illustrated to put any amateur craftsman on the road to the artistic solution of many of the little problems in decoration and furnishing that come up from time to time. Any of the designs described for other articles may be used on these holders by adapting them in size and form.



Detail of Candle Sconce



Detail of Whisk-Broom Holder

SCREW-PROPELLED STEAMER PATENTED IN 1803

One of the curiosities found in the French patent office is the drawings and description of a screw-propelled steamer for which a patent was granted to Charles Dallery in 1803. Although the mechanism of the machinery is exceptionally crude, the whole is remarkable in that the propellers are of the screw type, and that the boiler was of the vertical water-tube type, consisting of six units, each comprising 12 tubes, connected at the top to a common steam chamber from which the steam was to be carried to

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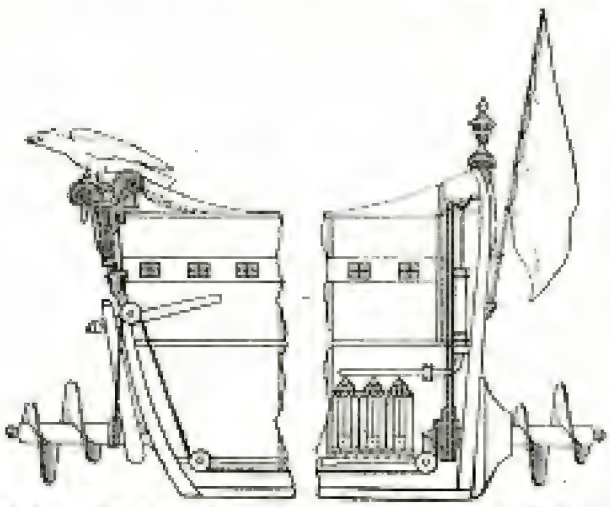
the cylinders. Dallery is said to be the first to design a vertical water-tube boiler.

The arrangement of the screw propellers is also interesting, one being



A Screw-Propelled Steamer, Fitted with Vertical Water-Tube Boilers, Patented in France in 1803

located at the stern and the other at the bow. The bow propeller was pivoted, as it was intended for steering the vessel.

At the time the patent was issued, Napoleon was contemplating an invasion of England. Dallery invested all his means in building his steam vessel and offered it to the government as a transport, but, receiving neither thanks nor encouragement, he, in despair, destroyed the vessel without even giving it a trial, and tore up his patents.

A CHRISTMAS AUTO TRAIN

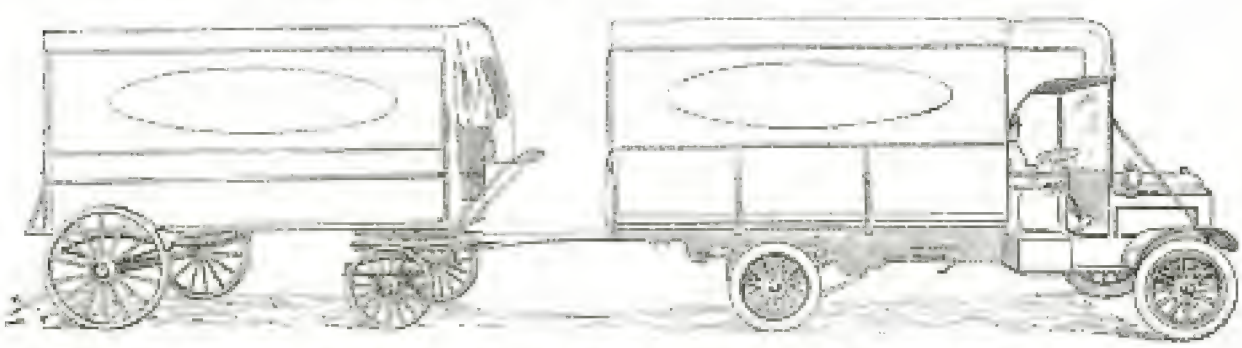
During the shopping rush just before Christmas, one of the largest department stores in Philadelphia found it necessary to attach a trailer to several of its heavy motor delivery trucks to take care of the suburban delivery.

BIRTHMARKS MAY SHOW KNIGHTLY DESCENT

According to Dr. P. Baroux, of Paris, writing in the Revue Scientifique, it is possible for the customs and habits of a social class, persisted in for generations, to leave their impress on far-distant descendants in the form of birthmarks, etc., long after the customs have ceased to be. He says he has found birthmarks in families not now in good social position which would indicate that they were of gentle descent, and investigation is said to have proved that the indications were correct.

The French physician attempts to show that the casque or headpiece worn by warriors in the age of chivalry would be likely to irritate the cheek and neck in precisely the regions where he has found the "birthmarks" which he believes to be hereditary marks of knighthood. Likewise, he believes that other peculiarities, such as what he calls "the martial hand," are also transmitted. This hand, while normally formed on the back, is much swelled on its under side by exaggeration of its flexing muscles. In its appearance it resembles that of masons or laborers who also, in handling trowel or pick, clench the fist and bend the fingers as in the exercise of arms.

¶A 250-mile pipe line, for the conveyance of petroleum, is being constructed in the Congo Free State, Africa, from Leopoldville to the coast.



The First "Christmas Automobile Train." A Means Adopted by a Department Store in Philadelphia to Care for Its Suburban Deliveries Just before Christmas

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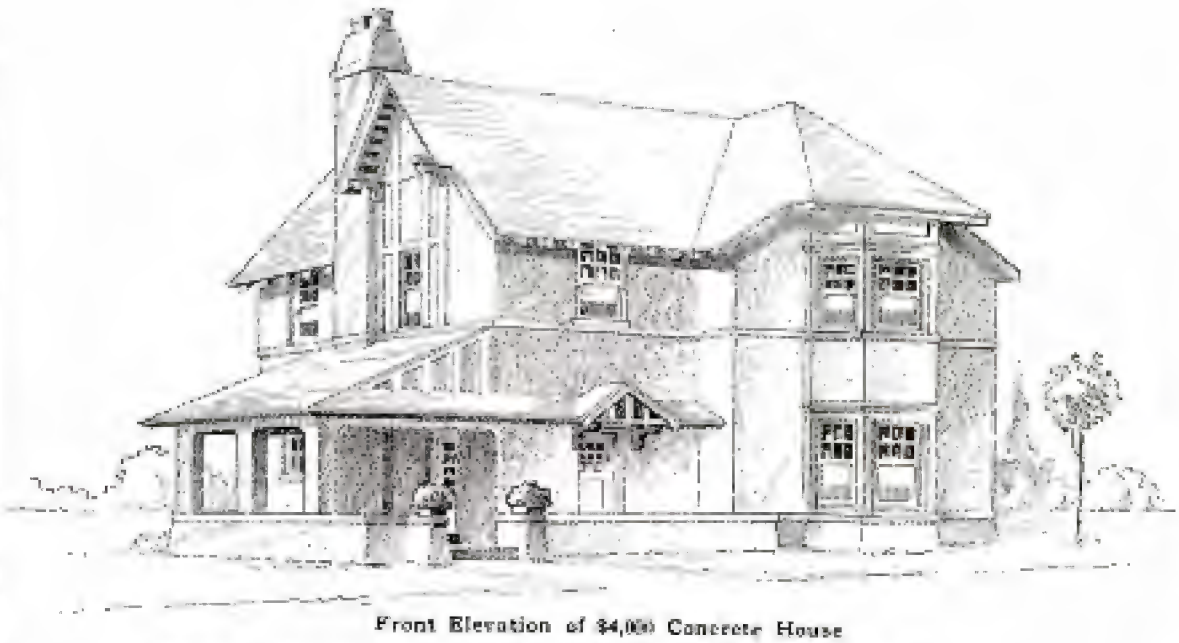
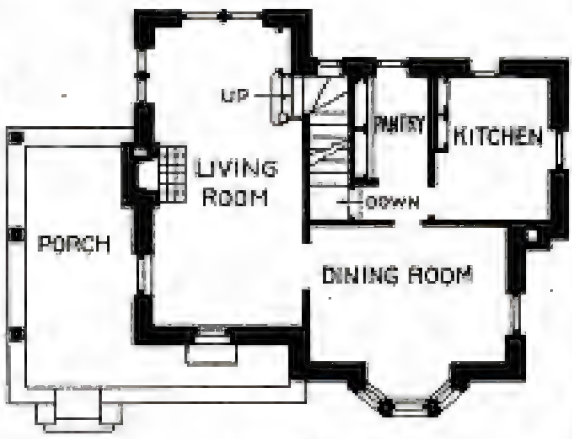
CONCRETE HOUSE AT MODERATE COST



Front Elevation of $4,000 Concrete House

Second-Floor Plan



First-Floor Plan

Rankin & Early, Architects, Philadelphia, Pa.

Every person of moderate means who designs a home for himself seeks to have something of his individuality reflected in his building, that it may be unlike the house of his neighbor. Architects are as keen to put the individual touch into their work as their clients, but the result is often such a compromise that the desire of neither is fully realized. The utmost skill is required of the architect to design a house that will fulfill all the requirements of the owner and come within the limit of his means. A set of plans for a distinctive $4,000 house was drawn recently by a Philadelphia architect. This house is provided with four bedrooms, a living room, a dining room, kitchen, bathroom and pantry, all of ample size and grouped in such a way that the exterior of the building has graceful lines of such design that it would appear equally well in city, country or suburb. The prin-

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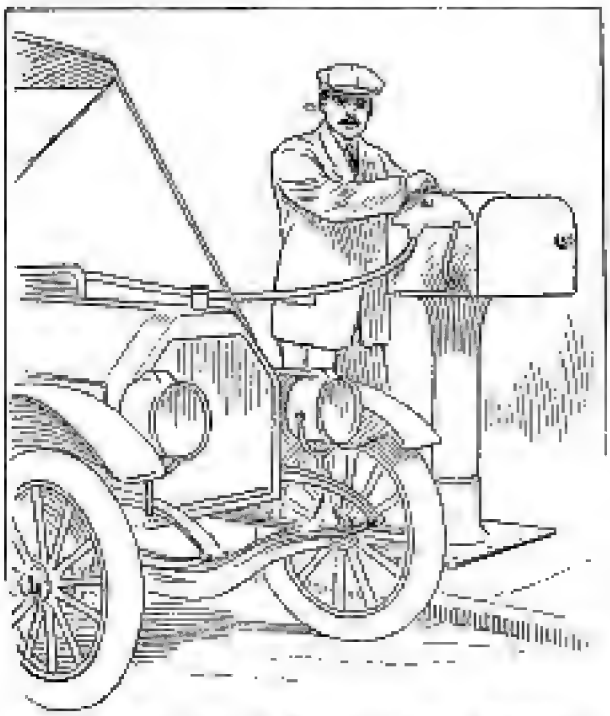
cipal bedroom and the dining room are both provided with bow windows and there is a porch of excellent size. The walls are reinforced concrete, and the interior finish of the lower floor is hard wood.

GASOLINE STATIONS FOR AUTOMOBILES

When a motorist finds himself without gasoline in Indianapolis, he need not worry about finding a gar-



Obtaining Gasoline by Placing a Coin in the Slot of a Curb Gasoline Station

age. A company is installing gasoline supply stations on the street corners and by dropping a coin in the slot and connecting up his tank with the hose, the motorist can renew his fuel supply in a few minutes.

SUBSURFACE WATER FOR IRRIGATION

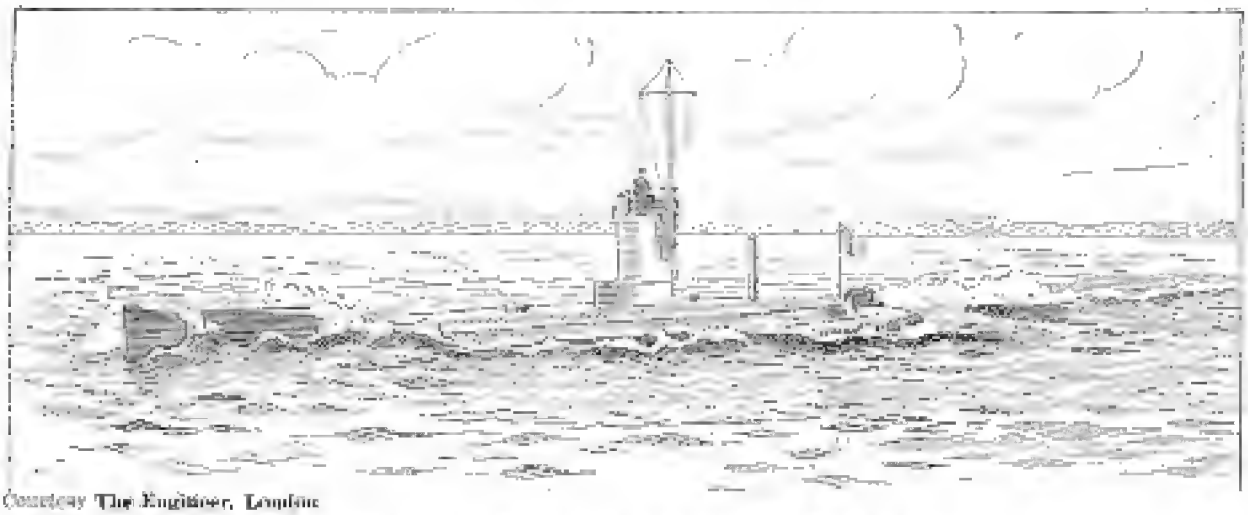
Although the use of subsurface water for irrigation is not a new method in the western states, the installation adopted in a section of Colorado lying directly north of Denver is of particular interest because of its economic possibilities. In this particular region the subsurface water or "underflow" is found at a depth of 20 or 25 ft., and the method of locating the pumps and the kind of installation, as described by an article in the Electrical World, is as follows:

Before the pumping plant is installed considerable work must be done to ascertain the location and quantity of the underflow. A special apparatus is built for drilling small, deep holes, and provision is made for taking out the core without disturbing the relative positions of the strata or the materials which make up the core. A hole is drilled and the test core taken out and analyzed, thus determining the depth of the water-bearing strata, and the thickness and porosity of the strata. The water content of the strata is then determined from direct measurement. After these determinations have been made, the operation is repeated on a number of holes put down in a 5-ft. radius, the first hole being taken as a center. All the determinations made upon the first are repeated in the later holes to check the accuracy of the first, then a standard chemical solution is introduced in the first hole and, by means of galvanometric measurements, the rate of flow from one hole to the other is determined.

By these tests are found not only the approximate rate of flow but its direction as well.

Holes are then put down at such a distance from the first hole that an hour's time will be consumed for the water to flow from the first to the last one. Where the conditions can be thus accurately measured, the amount of water that can be secured may be determined with much greater accuracy than can that of surface streams, as the waters found below the surface are subject to fewer factors of uncertainty.

A power company has its main transmission line running through the district in the form of a closed loop, inclosing an area of 940 square miles, and it is this power which is mainly used for pumping the irrigation wells.



Courtesy The Engineer, London

A Powerful German Submarine of Which Not Much is Known

THE GERMAN SUBMARINES

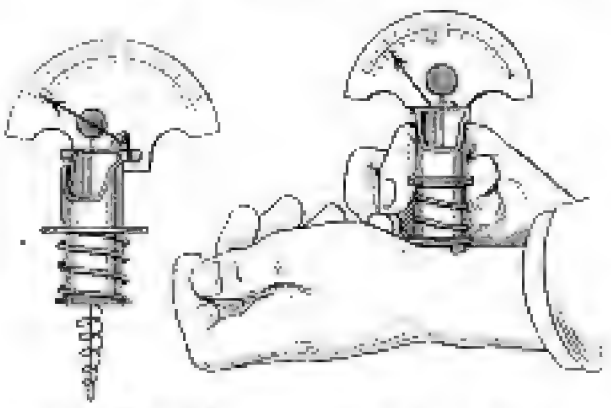
Although but little information leaks out concerning the submarines of the German navy, it is believed in England that they are more powerful and more numerous than is generally supposed. The submarines of the "U" class, of which one is shown in the accompanying illustration, are said to have a displacement of close to 190 tons, a length of 138 ft., a beam of 10 ft., and a submerged speed of about 11 miles an hour.

The submarine "U 8" is shown in the illustration. Its shape, particularly its bow, is somewhat different than those of either the American or British submarines.

SIMPLE DEVICE MEASURES BLOOD PRESSURE

This little apparatus, recently placed on the market by a maker of scientific instruments, serves to measure both the pulse beats and the internal pressure of the blood. The instrument comprises a small tube provided with a slender spring carrying a small disk at its upper end. When the lower end of the spring is applied to the pulse, the small disk oscillates in accordance with the number of beats.

In using the instrument to measure blood pressure as well as pulse beats, a second tube and its spiral spring are slipped over the first tube, as shown in the illustrations. At the top of this second tube is a graduated quadrant, the hand of which points to zero when the spring tube carries it in its extended position. After finding the position of the pulse and applying the bottom of the central spring to it, the outside tube is gradually pushed downward over the inner one, the spring carried by the former becoming more and more compressed, until the disk showing the pulse beats ceases to oscillate. At the moment the oscillation of the disk ceases the pressure applied in pushing the outer tube down over the inner equals the internal pressure of the blood, which is indicated by the hand on the quadrant.



A Device Which, Pressed against the Pulse, Shows the Pulse Beats by the Oscillation of the Disk, and may Also be Made to Indicate the Blood Pressure on the Scale

¶Italy is experimenting with the aerial post. Dal Mistro, an Italian airman, having recently carried a sack of mail from Bologna to Venice, a distance of 101 miles, in 1 hr. 28 min.

DEVICE FOR TESTING ELECTRIC-LAMP FILAMENTS

The device for testing metallic-filament lamps illustrated herewith, was devised by an engineer of the Western Railway of France. A description of the device appeared in a recent number of the Railway Age Gazette. The device is used to give the lamps that are being tested repeated shocks, so

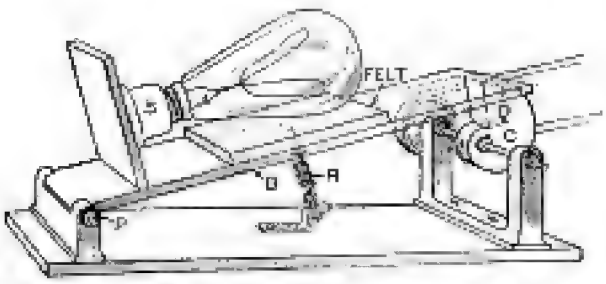


Fig. 1—Device for Testing Electric-Lamp Filaments

as to test the strength of the metallic filament under conditions corresponding, as nearly as possible, to those that would exist in practice. The lamp is placed in a socket, S, as shown in Fig. 1, which is mounted upon an upright piece attached to the board B, that is pivoted at the point P, and so arranged that it can be raised by the cam C, and allowed to fall through a distance, D. A piece of felt is mounted upon the board B, directly under the lamp, to deaden the fall; a spring, R, whose tension may be easily adjusted, is used to increase or decrease the force of the fall. The cam can be driven at any desired speed and the number of revolutions or shocks may be indicated on a revolution counter connected to the cam shaft.

The lamps are tested both hot and cold; and the electrical connections of the motor driving the cam shaft are such that the motor stops as soon as the lamp filament is broken. The main motor circuit is controlled by a relay, whose winding is connected in series with the lamp. The connections of this relay are given in Figs. 2 and 3. Figure 2 shows the connections for testing the lamp while it is burning; Fig. 3 shows the connections for testing the lamp cold. In the first case, the lamp and relay winding are connected in series and directly across the line. If the lamp burns out, the relay is no longer energized, its armature drops and the motor stops; since the circuit through the motor is broken by the falling of the armature of the relay.

In the second case, the lamp being tested is in series with the relay only a very short time, it being connected to the small segment S, as shown in Fig. 3. So long as the lamp filament is not broken, there will be a continuous current through the winding of the relay, but if the filament breaks, the relay circuit will be open when the brush B is in contact with the segment S, and the relay armature will drop down, opening the motor circuit and stopping the cam. The time that the brush B is in contact with the segment S is so small that the lamp does not heat up to any extent. The second lamp is used to prevent an excessive current passing through the relay when the brush B is in contact with the main part of the commutator.

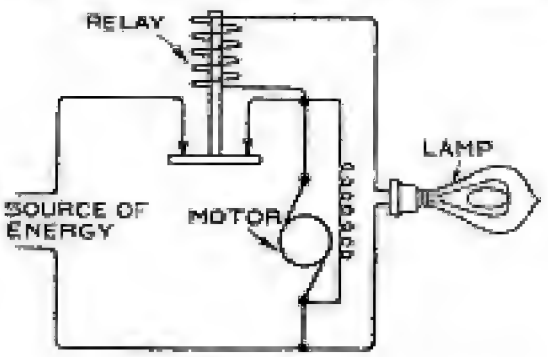


Fig. 2

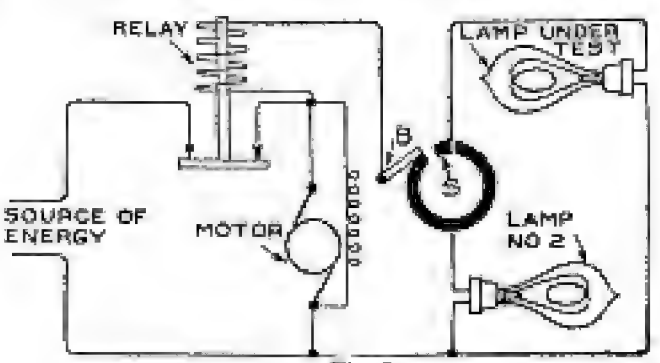


Fig. 3

Method of Testing Lamp Filaments Hot and Cold

ARCHAEOLOGISTS GIVEN A PREHISTORIC BANQUET

During an excursion in the valley of the Danube, the members of an anthropological society in congress at Heilbronn, Germany, were given a stone-age banquet by Edouard Hahn, an archæologist of Berlin. A sand bank in the middle of the river served as the table, and all the utensils, dishes, etc., used, were of wood, especially made for the occasion, in exact imitation of those used in the stone age.

The menu consisted of cabbage soup, cooked in a wooden bowl by placing heated stones therein; boiled "leg of horse," roast pork with stewed maize, turnips roasted in the ashes, and a dessert of dried berries served with honey.

According to the guests at this unique banquet, the human race of the stone-age period could have had no reason to complain of such fare.

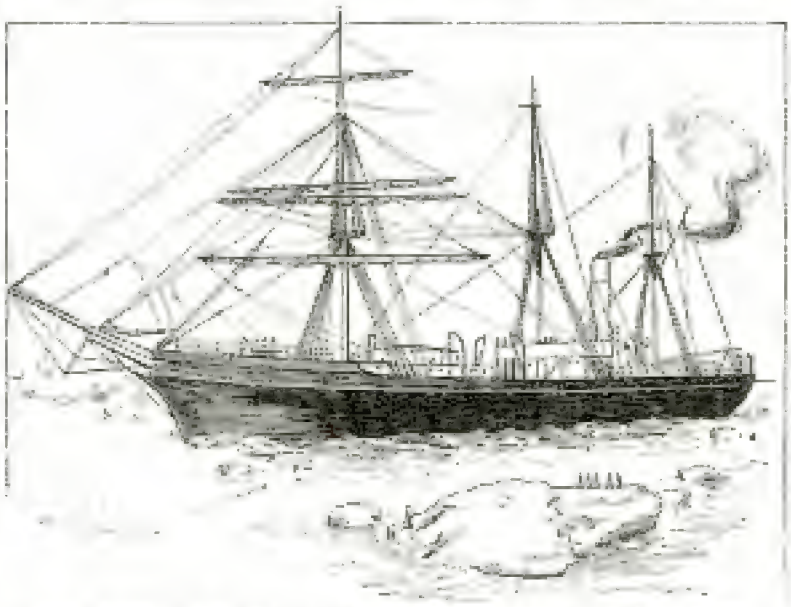
MOTION PICTURES OF THE OCEAN BOTTOM

A remarkable film showing the submarine gardens of the Pacific at the Catalina Islands, which are just off the California coast near Los Angeles, has been made by one of the great American motion-picture film companies. The film, which is said to be the first successful one of its kind ever attempted, shows very clearly the seaweed and other forms of submarine vegetation, coral, sea urchins, and many varieties of fish. By rare good fortune the operators got an octopus into the picture.

The submarine pictures taken cover about 50 ft. of film. In making the pictures, the machine was installed in one of the glass-bottomed boats in which tourists view the wonders of the deep.

AUSTRALIAN ANTARCTIC EXPEDITION STARTS

An Australian Antarctic expedition, headed by Dr. Mawson, sailed from Sidney recently in the "Aurora." One of the most important features of the work of this scientific expedition will be an investigation of Antarctic weather conditions with a view to discovering their effect on the coasts of Australia and New Zealand.

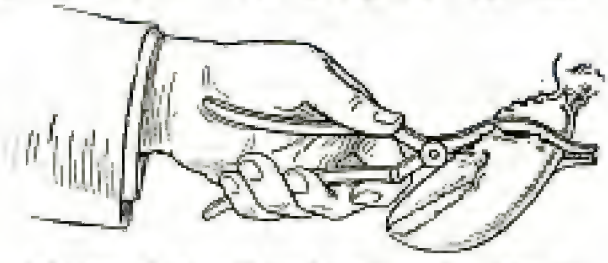


The "Aurora," in Which the Australian Antarctic Expedition is Penetrating the Far South

Among the contributions for financing the expedition was $35,000 from the government of New South Wales. Other of the Australian states also contributed, and large sums were given by individuals.

LOBSTER-CRACKING IMPLEMENT

An implement somewhat similar to a nut-cracker, but designed especially for the cracking of the shells of lobster claws, is here shown. The long han-



A Lobster-Cracker is the Latest Novelty Added to the Already Imposing Array of Tableware

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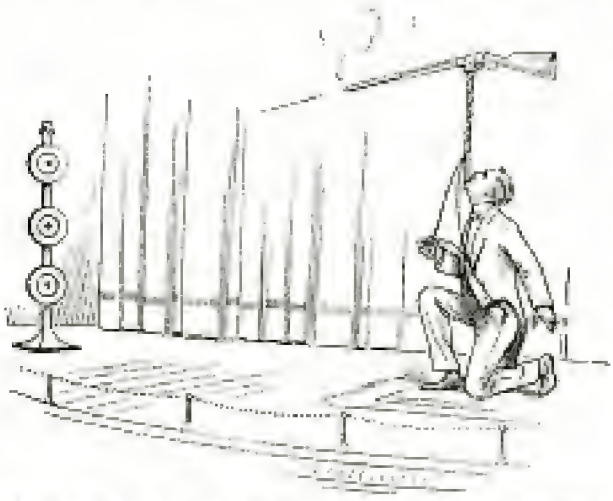
dles of the implement give sufficient leverage to break the strongest shell, while the pointed nose serves to grasp and pull out the delicious meat.

ELECTRICITY AS AN AID IN TRICK SHOOTING

Finding that the necessity of keeping the rifle trigger in reach of at least one finger of one hand or of one toe of one foot limits the number of



Trick Shooting in Which the Rifle Trigger is Operated by Pressing an Electric Button

spectacular firing positions assumed by trick marksmen, one of the professional shots often seen on the American stage is utilizing electricity as an aid. Balancing the rifle on a notched broomstick, which he in turn balances on his chin or on the sole of one foot held upright when he is reclining on his back, this professional pulls the trigger by simply pressing a button held in one hand. A pocket battery is connected by a flexible cord with a magnet, taken from an annunciator, fastened to the stock of the rifle in such position that its ends are near those of a piece of soft iron riveted to the trigger.

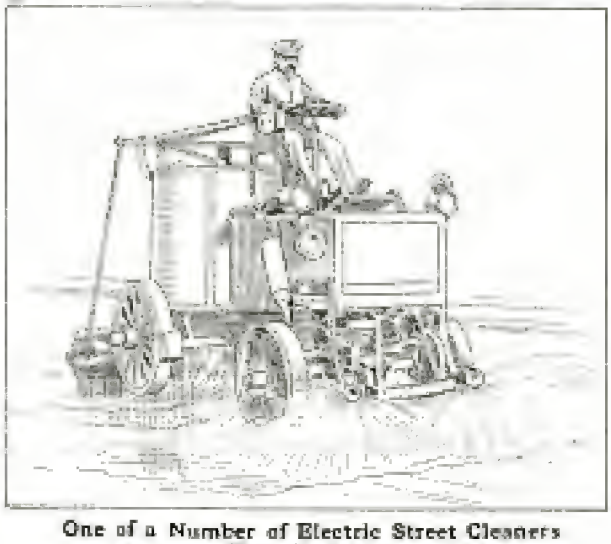
CIRCULATION OF THE BLOOD

Among the many interesting features of the International Hygienic Exhibition at Dresden, Germany, the one which most interested the general public, was the "Temple of Man," in which a number of mechanical devices were shown to demonstrate the different functions of the human mechanism. Perhaps the most ingenious of these was the representation of the circulation of the blood.

In this representation a full-sized skeleton was used, the heart, with its four chambers and valves, being shaped of rubber bladders. The arteries and veins, with the capillaries joining them, were formed of tubes of red and blue glass. The heart was made to beat 80 times a minute by an electrical device, and at each beat sent a colored fluid streaming first into the lungs, then back to the heart, and then through the whole body, thus presenting a true picture of the circulation.

ELECTRIC STREET-CLEANING MACHINES IN BERLIN

Berlin, Germany, has somewhere in the neighborhood of 25 electric street-cleaning machines, all of which are rendering fine service. One of these machines will cover 20 to 25 miles per day, and although the speed is only 10 per cent greater than that of a similar horse-drawn vehicle, the work accom-



One of a Number of Electric Street Cleaners Used in Berlin

plished is much greater, as the electric machines carry more water, have greater flexibility of manipulation in crowded traffic, and are much speedier when empty.

The tanks of the electrical machines

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hold 660 gal. of water. Forward of the front wheels are two shower pipes, operated by foot levers, which serve to loosen the dirt. The main shower pipes are directly under the tank, and the cleaning roller, equipped with a spiral of soft rubber, is situated behind the rear wheels, being driven by a gear connection with the rear wheels.

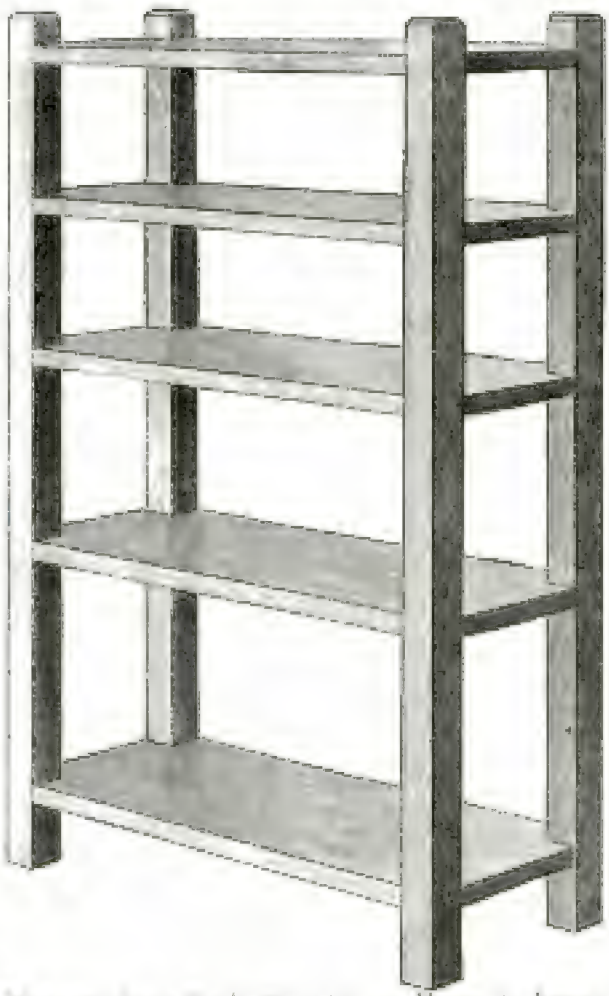
The battery is mounted in front of the driver and comprises 40 cells of 200 amp.-hour capacity at the 5-hour rate. A 4-hp. series motor is attached to each of the forward axles. The weight of the cleaner empty is about 8,000 lb.

HOW TO MAKE A MAGAZINE RACK

The accompanying cut shows a magazine rack that will find favor with many amateur wood-workers on account of its simplicity in design and its rich, massive appearance when properly finished. It is so constructed that each piece may be polished, stained and finished before it is finally put together. Quarter-sawed oak is the best wood to use. Plain sawed oak looks well but it is more liable to warp than quarter-sawed and this is quite an element in pieces as wide as the ones here used. Following is a list of the material needed:

4 posts, 2 by 2 by 40 in., S-4-S.
5 shelves, 1 by 14 by 24 in., S-2-S.
20 F. H. screws, 2 in. long.

Considerable labor can be saved if the material be ordered from the mill ready cut to length, squared and sanded. The corner posts should be made first. The most convenient and accurate method of laying out the mortises is to square one end of each post and lay them on the bench flat, with the squared ends even with each other; then clamp them securely and lay out the mortises on one side across all four pieces at once; then loosen the clamp and project the marks to the other side with a try-square. Now saw along these marks, making each cut just deep enough to bring the mortises diagonally across the piece from one corner to the opposite corner as shown in the detail sketch. Be careful not to get the mortises wider than the shelves are thick. Bevel the tops of the posts as shown.



Magazine Rack Easily Made by the Home Craftsman

See that the ends of the shelves are square and smooth, then set a scratch gauge so that the scriber is just 2 in. from the face of the block and mark this distance off each way from the corner of the shelves. Saw these corners diagonally across as shown, being careful not to saw off too much.

The parts can now be assembled. Place all the parts in position, then pass a rope around each end and twist it up tightly with a small stick. If this is properly done you can now pick up the rack and handle it in any way you wish. The screws can now be put in the corners. You can use flat-head screws and plug the holes, or you can use round-head blue screws and let the heads project. After the screws are all in, dress off all unevenness where the

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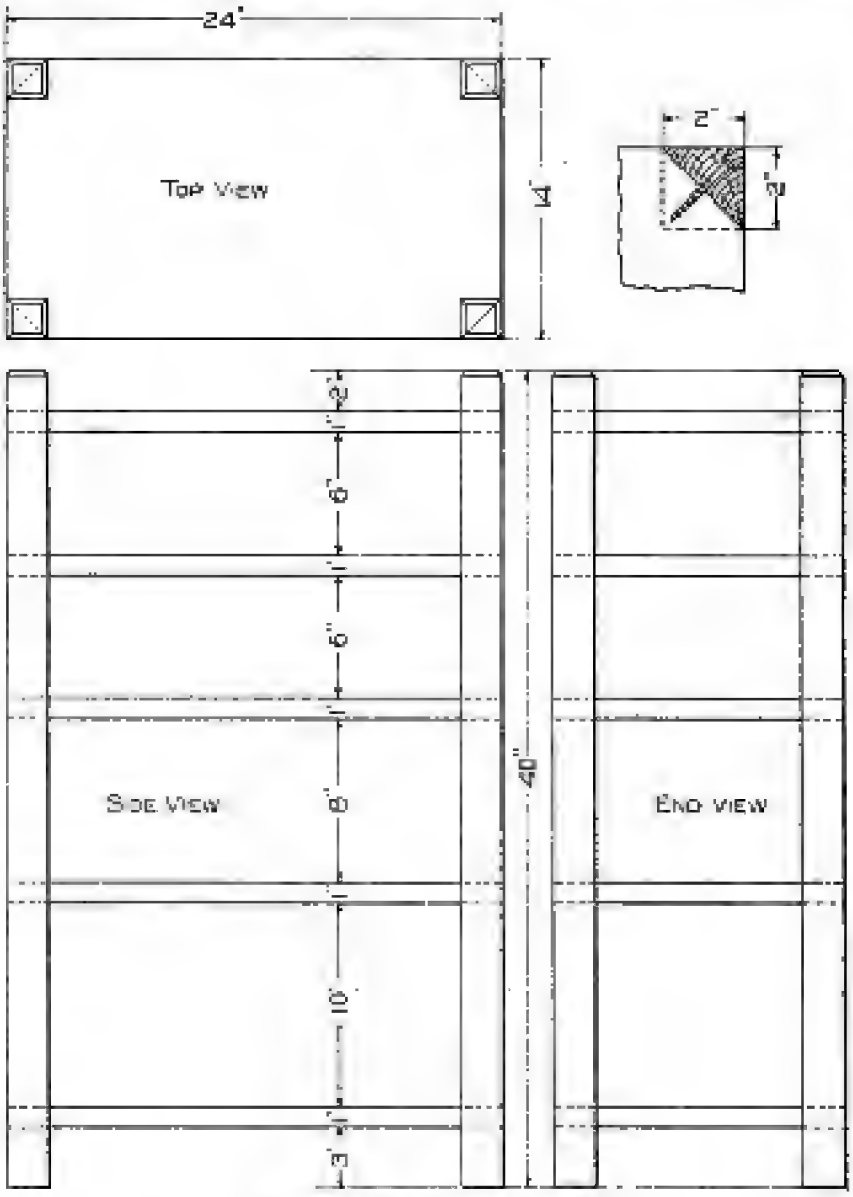
shelves are mortised into the posts, then mark each shelf and post so that you can put it together again after the parts are finished. Take the rack apart and transfer the marks to some part of the mortises and shelves that will not be covered with the finish you intend to put on. Apply the finish you wish to use and when the parts are thoroughly dry they can be reassembled and your rack will be complete.



Detail of the Magazine Rack

¶A New York authority on spelling has discovered 13 ways of representing the sound of long "o"—so, boat, roe, oh, door, soul, though, low, owe, yeoman, sew, hautboy and beau.

FALSE TEETH WERE USED BY ANCIENT ROMANS

Among the million patents the United States government has issued to protect the devices of men who believe they have found something "new under the sun," despite the old philosopher's screed to the contrary, there are a number that deal with various forms of dental surgery and especially what is known as bridge work. The Journal of the American Medical Association in an editorial recently set forth a number of newly acquired bits of information that would seem to refute the proposition that modern dentistry is modern, by recounting the achievements of unknown dentists of ancient Egypt and Rome.

Just who the dentists were, the historians do not always relate, but the results of their work have proven beyond a doubt that bridge work of the most skillful kind was done as long ago as six or seven centuries before Christ.

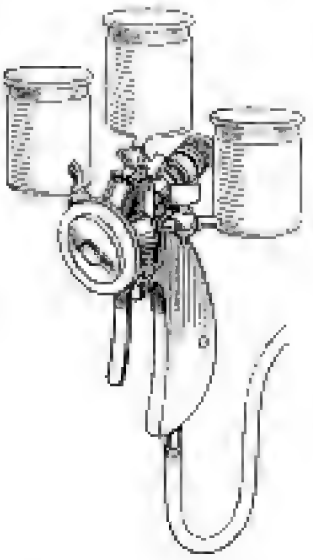
In the tomb of Sidon were found four incisors and two canine teeth in the jaw of a woman that were held together by gold wire, two of the former being transplanted teeth—what might be called crowns in this day—fastened in by gold wire. In the museum at Corneto, the ancient capital of the Etruscan federation, are to be seen several specimens of bridge work done by riveted bands of metal. One of these bands supports three artificial teeth, and another, two artificial teeth, the latter being made from a

single ox tooth grooved to imitate the teeth of a human being. These were made in the sixth or seventh century before Christ.

Under the laws of the twelve tables, written in Rome, 450 B. C., while it was expressly forbidden to bury gold ornaments with the dead, a special exception was made for gold with which teeth may be held together. Martial, one of the satiric poets of Rome, once referred to the teeth of one woman as dark and another as white and explained the difference with the statement that one of them bought her teeth while the other had her own. The transplantation of teeth from the mouths of slaves into those of their mistresses is said to have been a common practice in the early days of the Roman empire.

THREE-COLOR AIR BRUSH

While not materially different in construction from the ordinary air brush, this brush, now being marketed in France, is different in that it has three color cups, the outlets from which, it is claimed, are so constructed that there is no possibility of the colors becoming mixed when one color is turned off and another on.



¶The remarkable increase in the demand for motor-driven commercial vehicles is shown by the fact that at the New York motor-truck show space was reserved for the products of 31 manufacturers of such conveyances.

¶The number of men engaged in the mines and quarries of the world is considerably over 6,000,000, of whom about 700,000 are in the United States.

ADJUSTABLE SUNSHADE FOR MOTOR RIDES

An adjustable sunshade, designed especially for use when riding in automobiles, is being marketed in England. The shade can be adjusted to any angle on the handle and is useful as a protection from the sun when fine weather makes it advisable to push back the automobile hood.

EXTENT OF MOTOR INDUSTRY

The United States leads the world in the number of automobiles in service and the annual output by large figures, far outrivaling the United Kingdom, France, Germany and Italy combined, in both consumption and production. The number of automobiles in service in the United States, according to figures compiled by Motor, is 500,000, while the output for the year 1911 is estimated as 190,000. The number of cars in service in the United Kingdom (England, Scotland, Ireland and Wales) is given as 150,000, the annual output as 25,000; France has 85,000 in service, and an annual output of 40,000; Germany, 50,000 in service, and an annual output of 15,000; Italy, 15,000 in service, and an annual output of 5,000.

The valuation of the total output of cars in the United States in 1911 is given as $215,650,000.

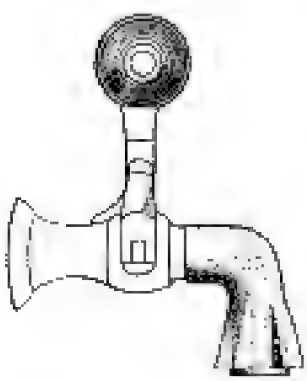
"MESMERIZING" LOBSTERS

The last report of the Sea Fisheries Committee of Northumberland, Eng., gives considerable space to the "mesmerizing" of lobsters. The usual method, states the report in all seriousness, is to hold the lobster's head down, with the claws arranged so as to form a support with the rostrum, and to rapidly stroke the part of the shell covering the head and tho-

rax with the tips of the fingers. In about a minute the lobster succumbs and will remain without movement for a variable period. In order to see whether the holding of the head down, so that the blood will rush to it, is essential, a lobster was treated with the head up, and so successfully that it remained without movement for three hours. Placed in sea water the lobster will immediately recover from the "mesmerizing" treatment.

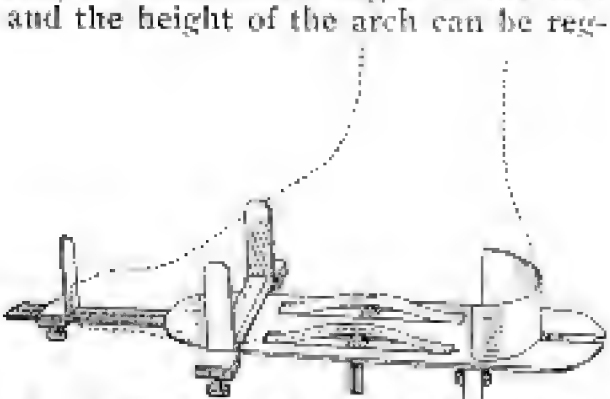
GLASS PROTECTOR FOR FOUNTAIN FAUCETS

The glasses used for serving beverages at soda-water fountains are often broken by striking against the metal faucets, and to prevent this a rubber company is placing a protector on the market. It is a corrugated rubber sleeve that fits over the faucet and acts as a cushion for the glasses.



DEVICE FOR MEASURING THE FEET

A recently patented device for measuring the feet in fitting shoes is shown in the accompanying drawing. By its use, the width and length of the foot and the height of the arch can be registered in degrees of $\frac{1}{16}$ in. The arch of the foot is placed on the bowed or arched steel pieces in the center.



A Device for Measuring the Feet in Fitting Shoes

FLATFISH COPY PATTERN OF SEA-BOTTOM

In experiments made at the United States fisheries laboratory at Woods Hole, Mass., Francis B. Sumner has drawn attention to the remarkable ability of the flatfish to not only change its hue to conform to the color of the background on which it happens to lie, but to copy the geometrical pattern of the background as well.

The phenomenon of changing the hue has been known for a long time, and for a time biologists supposed the adaptation was effected by action of light upon the skin. A quarter of a century ago a biologist proved that it was brought about through the functioning of the eye. He found that blinded fish do not change their color adaptively.

The astounding behavior of the flatfish in adapting its own geometrical skin patterns to copy the geometrical pattern of the sea-bottom upon which it rests, however, was given no serious attention until Mr. Sumner made his discoveries last year. "In observing a turbot," says Mr. Sumner, "I was impressed by the detailed resemblance which obtained between the markings of the skin and the appearance of the gravel on which the fish rested. . . The query at once suggested itself: Is it a mere coincidence, or does the fish have the power of controlling the color pattern as well as the general color tone of the body?"

This question was answered by preparing a number of backgrounds, some reproducing various types of natural sea-bottom, and some being highly unnatural geometrical patterns, such as checkerboard, polka dot, stripes, screen, etc. Placed in a tank having one of these patterns the flatfish began to copy the pattern on its back. The time taken ranged from several seconds to several days, according to the nature of the pattern. A change involving the almost complete withdrawal from view of the skin pigments in a dark specimen probably required the longest period. The fact that prac-

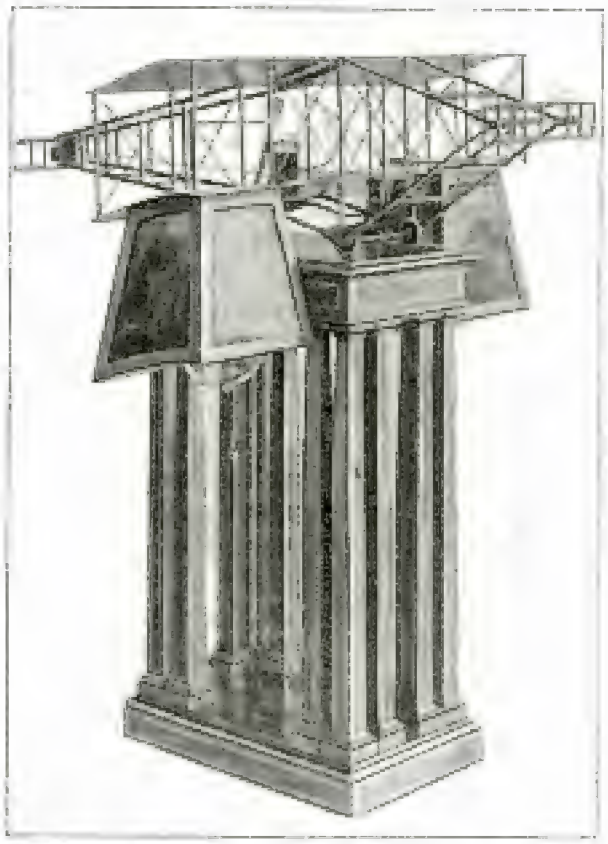
tice or habituation to these changes greatly reduced the time required was also shown, as certain specimens, after several changes of background, were found to adapt themselves, in almost full measure, to one of these within a fraction of a minute.

The discoveries of greatest interest, however, are that the imitation or change is accomplished through the flatfish's eyes, and that only part of the fish's visual field is involved in the process, the imitation not being of everything it sees, but of the bottom immediately under or around the fish. Sumner demonstrated that the imitation is accomplished through the eyes by cauterizing the flatfish's eyes with silver nitrate, blindfolding them, or blinding them completely. So treated, the fish ceased altogether to imitate the background pattern, and its hue reverted to an even dark shade.

The discovery that the imitation is practically only of bottom immediately around the fish was made by a series of experiments in which the walls of the tank were variously colored and patterned. The influence of the vertical walls proved to be subordinate, even in cases where the fish was so large that it covered a considerable fraction of the bottom and was obliged to lie constantly with its eyes close to one side or the other of the tank. Although the flatfish notices objects directly overhead, following such with its eyes and moving toward or away from them, the very same pattern which sets up the pigment reactions when it is underneath the fish has absolutely no effect when above it. The change of color and pattern is also only on the back, and the belly is not sensitive to change.

AEROPLANE LAMP FOR AERO CLUBS

Believing that the lighting fixtures of aeronautic clubs and other organizations interested in aerial navigation should be distinctive, a South Berkeley, Cal., inventor has designed an aeroplane lamp, which may be placed

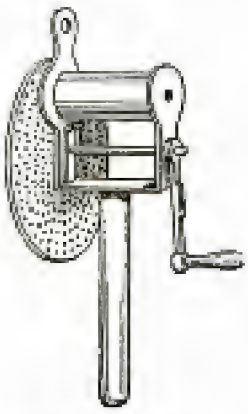


A Clever Lighting Fixture Designed for Aeronautic Clubs

on a pedestal as shown, or be slightly altered for use as a hanging fixture. The electric lamps are contained in art-glass shades hanging from the lower plane of a biplane on both sides.

REVOLVING NUTMEG GRATER

In the French nutmeg grater shown in the accompanying drawing the cylindrical indented surface of the ordinary grater is replaced by a disk revolved by means of a crank. The nutmeg is inserted in the tube shown at the top and is held against the disk by means of a spring.



Massachusetts has the largest percentage of motor-driven vehicles, according to a state report just issued, more than 30 per cent of all the vehicles in the state being self-propelled.

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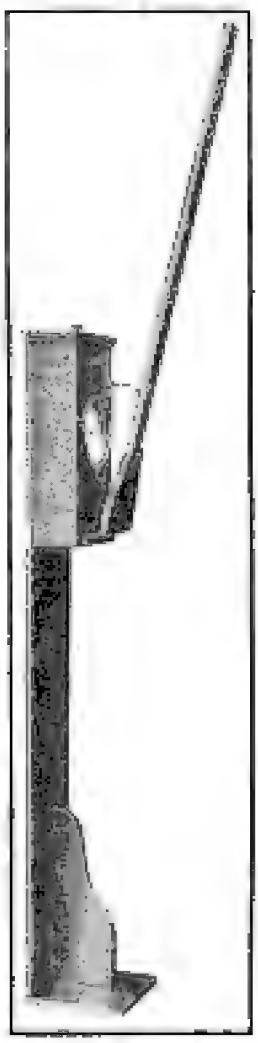
AN ALARM CLOCK MADE TO WAKE THE DEAF

If the ordinary person has trouble in hearing an alarm clock when it rings at an early hour in the morning, what chance has a deaf person to be awakened by such means? The answer is that the deaf man had absolutely no chance until an English inventor interested himself in the matter and provided a form of alarm clock that is guaranteed to awaken the deaf. The clock part of the invention is incased in a wooden box that is placed at the top of a standard of which it forms a part. A long arm is hinged to the bottom of the box. The clock is placed beside the bed of the person wishing to be awakened. The long arm is connected with a trigger which is released at the time set, and falls, striking the body of the sleeper a light quick blow which is said to awaken him from the deepest slumber.



GOVERNMENT WORK ON LAND AND WATER

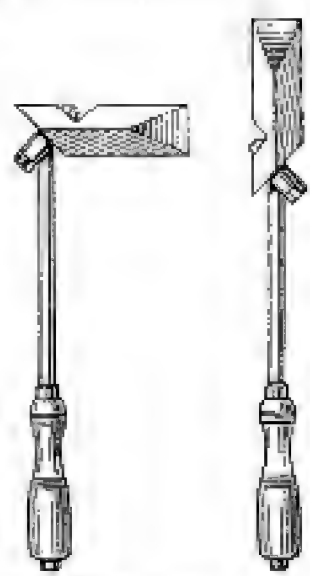
Recent extensions of the government work being done under the direction of the Department of Agriculture, include the preparation for publication by the Weather Bureau of meteorological charts of the North and South Atlantic, the North and South Pacific and the Indian Oceans, and of the Great Lakes. Besides, the Weather Bureau and Forest Service combined are making an exhaustive study of the entire question of forest effects upon climate and streamflow.

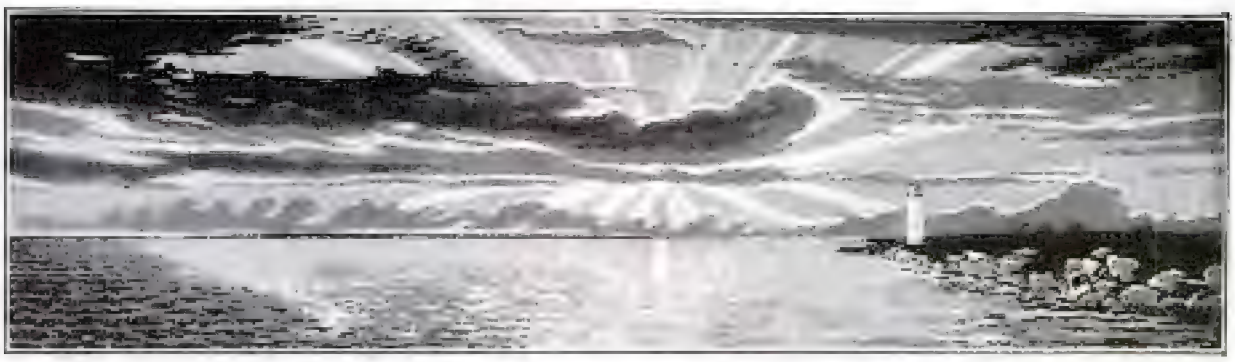
In collecting the data utilized in the preparation of the meteorological charts, of which the first are now being distributed, the services of 2,416 marine observers have been enlisted, and 10,669 books of weather reports have been issued for their use. The wireless-telegraph service and the vessel-reporting service, the first conducted through coöperation with various wireless-telegraph stations and the latter at the seacoast stations of the Atlantic and Pacific coasts, have been particularly serviceable to marine interests.

In the work of studying the forest effects on climate and streamflow, the experiment station at Wagon Wheel Gap, Colo., established for the purpose of this investigation, is now on a firm basis, and a complete series of observations has been made during the past year. Coöperative stations are also maintained in the Coconino National Forest in Arizona and in the Fremont National Forest in Colorado, and experimental areas may be secured and plants installed in both the Allegheny and White Mountain regions.

ADJUSTABLE SOLDERING IRON

A soldering iron which can be adjusted at various angles on the handle is being marketed in France. It is shown in the two extreme positions in the drawings, but can be adjusted to any intermediate angle by simply operating the screw which holds it to the handle. It is an iron adapted for difficult positions.





The Wonders of Light

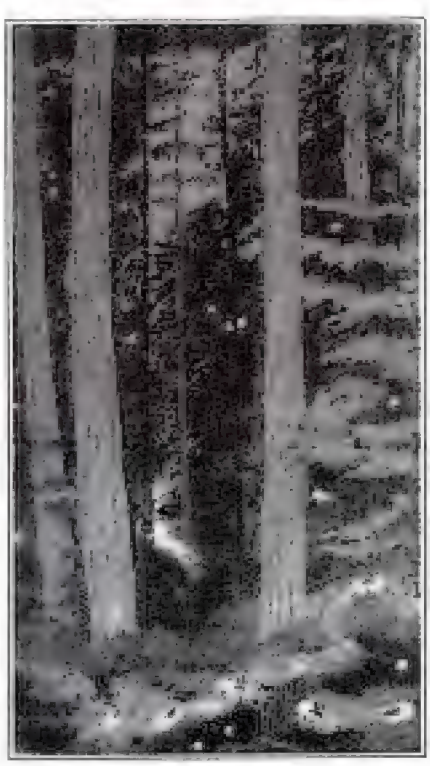
By J. GORDON OGDEN, Ph. D.

I—The Nature of Light and How Light Travels

This is the first of a series of articles by the author of "Heat" and "The Kingdom of Dust," which have appeared in this Magazine. Dr. Ogden is professor of physics in the Fifth Avenue High School, Pittsburg, Pa.

WHAT is light? Whether it be the dim fox-fire produced by decaying wood, the mystical gleam of a firefly or a glow worm in the shadowy forest, the "Will o' the Wisp" that flits hither and thither over a marsh, the flash from a meteor flying swiftly across the sky, the tremulous quiver from out the vast abyss of the star depths, the emblazoned pathway of a bolt of lightning, or whether it be the illumination produced by a pine knot, a candle, a gas jet, an incandescent mantle or filament, light is one of nature's mysteries—a problem set for man to solve.

And man has learned in the ages that have elapsed since he was created, that by far the greatest part of the mystery lies with himself. The perception of light, heat, sound, and possibly of other forms of energy to which he cannot as yet give even a name, depends almost entirely upon the chemical and physical changes that take place within his own body—especially in the brain and its faithful outposts in the nervous system. In our consideration of the wonderful properties of light we shall not dwell at length upon the psychological phases of the subject, but shall attempt to make clear some of the simpler physical phenomena with which everyone is more or less familiar, but which are nevertheless not generally understood. We shall regard light as a form of energy, a definite thing—the thing that enables us to see, the thing that gives us the power to distinguish green from red, the thing that hammers away at the emulsion on a photographic plate causing the chemicals therein contained to deposit a thin film of metallic silver, which we may utilize in making a picture of a landscape, a comet, or the face of some dear friend.



Light is One of Nature's Mysteries

Up until the last century or so, throughout the thousands of years that man has been a thinking and reasoning being, little was learned concerning light. From its association with heat, some philosophers, including the brilliant Lavoisier, reasoned

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that light is an element on a parity with iron and oxygen. This belief is a survival of the teachings of Aristotle, who claimed that there are only four elemental substances in nature—earth, air, water, and fire.

One of the first experimenters to tell us something definite and something true about light was a young Danish astronomer, Olaus Roemer, who determined the velocity of light in 1675. Many years before the time of Roemer, an Italian scientist, Galileo, had satisfied himself that light did not require any time to travel from one place to another; in other words, that it could cover any distance instantaneously. He based this belief on the outcome of a very crude experiment. In the neighborhood of his home were two hills separated by a valley about a mile wide. On one hill he stationed an assistant with a lantern. Galileo, on the other hill, displayed a light. At the precise instant both lights were extinguished. Galileo thought that a perceptible time would elapse between the snuffing out of the lights, and the perception of the same from either hill, just as some seconds of time must intervene between the flash and report of a gun under similar conditions. Galileo could not notice any interval, although he performed the experiment many times, and lamely concluded that there was none.

These experiments and the conclusion therefrom, were generally accepted, until Roemer made his wonderful, though simple deductions from his observations of Jupiter's nearest satellite. From his station in the observatory at Paris, Roemer noticed a peculiar variation in the time of the appearance of one of Jupiter's moons. It was well known to him that the moons of Jupiter disappeared at certain intervals behind that planet, and then, after a certain period of hiding, known among astronomers as an eclipse, reappeared on the other side. This, of course, was very simple, but one peculiar fact puzzled him: Sometimes these eclipses were unaccountably delayed, although he knew that the nearest moon always moved with practically the same velocity. Why, then, did it not always remain hidden for exactly the same interval of time?

Finally the explanation came to him. He noted that the greatest discrepancy in the time of occultation occurred once in each year when the earth was farthest from Jupiter. It became clear to him that the satellite really appeared on schedule time from behind Jupiter and sent its light speeding on its way to the earth. Now if the earth were nearest to Jupiter on the first of January, it would be farthest away on the first of July. Therefore when the light from Jupiter's moon arrived at the earth's orbit on July first, the earth was not there to receive it. The light then traveled on until it met the earth on the other side of its orbit. Obviously this would take time. Roemer knew the diameter of the big ellipse in which the earth moves. He divided this enormous number of miles by the number of seconds it took the light to cross this distance, and presto! the velocity of light was known! The velocity as determined by Roemer was upward of 186,000 miles per second.

This same problem has been worked out by other experimenters since the time of Roemer, and by other methods, more accurate and more refined. Roemer's determination remains practically unchanged. The latest determination, that of Professor Michelson, gives the velocity of light in a vacuum as 299,860,000 meters per second, the equivalent of 186,330 miles. No wonder Galileo had drawn a wrong conclusion from his experiment, as the interval between the snuffing out of the light on one hill and its perception on the other hill, was only the 1-186,000 of a second. No matter how accurately he might perform the experiment with the crude means at his disposal, it was manifestly impossible to detect such a slight interval of time.

How does light travel? There are only two ways in which energy of any kind may be transferred. Matter

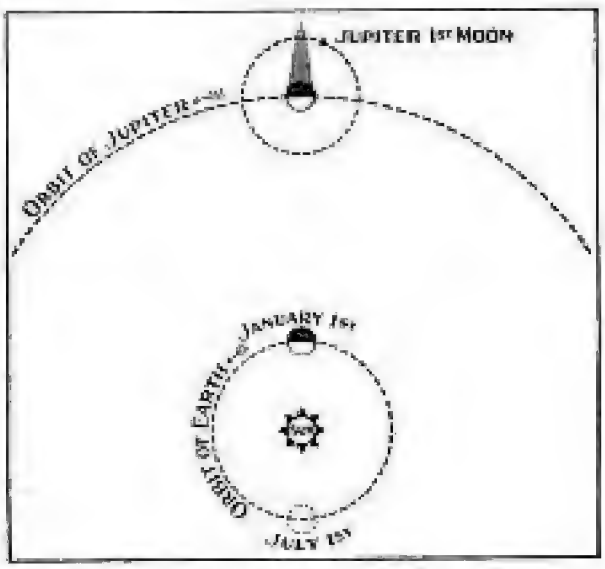
Galileo Attempting to Ascertain the Speed of Light

must be actually projected from one place to another, as illustrated by the flowing of a river, or else there must be a series of waves or pulses set up in some more or less stationary medium that will carry the disturbance, as illustrated by the sweeping of great tidal waves across the ocean, twice in every 24 hours, through the attractive influence of the moon. Which of these two forms of transfer is used by light? Does the sun, 93,000,000 miles from the earth, project small particles of matter across that immense space, or does its energy reach us in the form of waves?

The pioneers of science in the seventeenth and eighteenth centuries debated these questions with great brilliancy. Sir Isaac Newton taught that light and heat are material things each associated with the other in some mysterious way. He believed that a luminous body sends forth billions of incandescent particles, infinitely small in size; that these particles, or "corpuscles" as they were termed, enter the eye and stimulate the sense of sight into activity. Robert Hooke, an eccentric English mathematician and natural philosopher, denied the reasonableness of the corpuscular theory of light, and proposed what is now known as the undulatory or wave theory. As Hooke's theory was largely guesswork, his arguments were weak and easily answered by Newton.

Over in Holland, Christian Huygens, a natural philosopher of renown, studied with eager zeal the merits of the different theories. He entered the debate and advanced such additional arguments in favor of the wave theory that he is commonly considered to be the originator of the general doctrine of the propagation of light by means of waves. Newton accepted the gage of battle thrown down by this new adversary and the scientific publications of the day are full of the details of this celebrated discussion. For three quarters of a century after the death of Newton, this bloodless battle was waged. In the absence of scientific proofs or actual demonstrations, however, the arguments on both sides were simply matters of opinion.

Now it is a well-known fact that a concentrated solution of certain chemical substances will rapidly crystallize when a small crystal of the substance is thrown into the liquid. The controversy concerning the nature of light needed but the addition of a small crystal of scientific truth to simplify



How Roemer Found That Light Travels Upward of 186,000 Miles a Second

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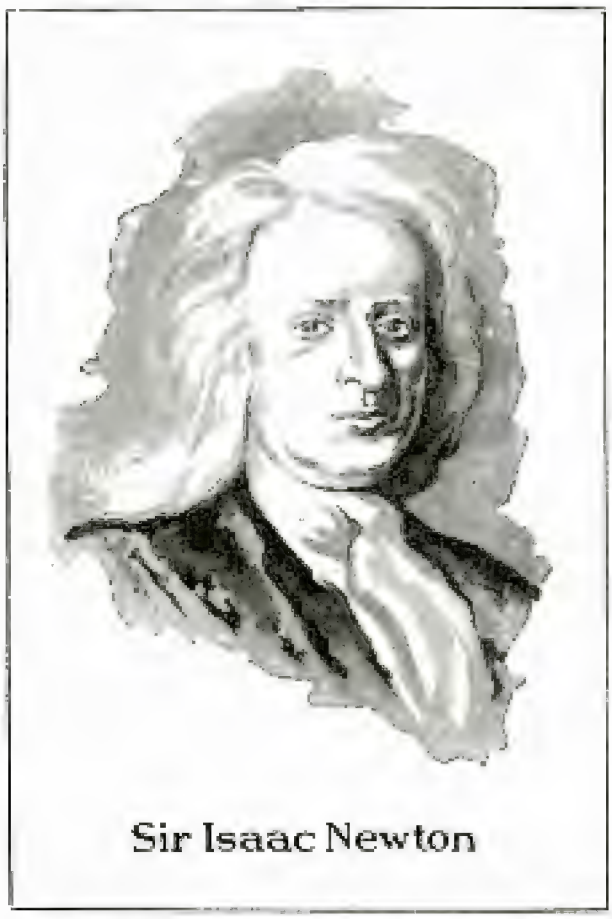

He Believed That a Luminous Body Sent Forth Billions of Incandescent Particles

and clear up the whole matter. And the crystal of truth—the result of an experiment that anyone could perform—was supplied by the celebrated Dr. Thomas Young.

Let us stop a moment and learn something of the personality of this wonderful man before we learn more about his epoch-making experiment. Born in England in 1773, even in his childhood he gave evidence of unusual intellectual powers. While an infant in arms he could read fluently. At the age of four, he had read the Bible through twice. At 14, he could read and write 14 languages, including such difficult tongues as Persian, Arabian, and Ethiopian. As he developed into the full vigor of manhood, his intellectuality became even more pronounced. As one writer said of him: "He seems to have entered every available field of thought—mathematics, physics, botany, literature, music, painting, languages, philosophy, archæology, and so on, to tiresome lengths—and once he had entered any field he seldom turned aside until he had reached the confines of the subject as then known, and added something new from the recesses of his own genius. He was as versatile as Priestley, as profound as Newton himself."

The Simplest Demonstration of Wave Motion

Doctor Young became interested in the debate concerning the nature of light, and, like Huygens so many years before, weighed the evidence on both sides. His wonderful perceptive powers enabled him to grasp the subject in its entirety, and his equally wonderful reasoning powers soon gave him the argument that finally overthrew the followers of Newton. On Nov. 21, 1801, he delivered a lecture before the Royal Society, on "The Theory of Light and Colors." This lecture marked the beginning of a new epoch in physical science.

Although Young had already pointed out the extreme improbability that particles of matter could travel at the enormous speed of 186,000 miles per second, one argument was advanced by him that was quite convincing.

The reader will be interested in learning just what Young had discovered, but before we enter into an explanation of it, let us recall what happens when a stone is dropped into a pond of still water. A number of tiny waves start out in every direction from the point of disturbance. If a second stone is dropped at the same time in another part of the pond, a second series of waves, similar to the first will start on its way. When these two sets of waves meet, they must do one of two things: they must either combine to form waves higher and deeper, or else they must destroy each

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other wholly or partially, and cause the surface of the water to lose its wrinkled appearance and become smooth again. In other words, the waves will either "reinforce" each other or else "interfere."

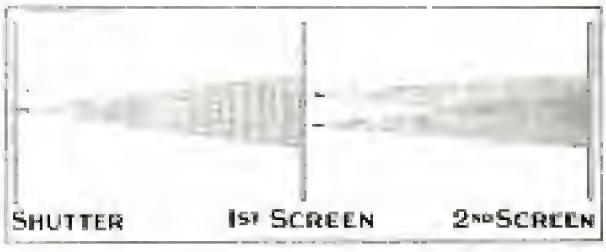
This word "interference" is a very important one in the explanation of how light travels, as it was the demonstration that light added to light might produce darkness or increased brightness, that enabled Young to prove the reasonableness of the theory that light travels in waves. Young's experiment was quite simple. He admitted a beam of sunlight into a darkened room through a narrow opening in the window shutter. He placed a screen containing two minute holes quite close together, in the path of this beam. The two holes permitted twin beams of light to pass to a second screen of white cardboard, where they met and overlapped. The overlap, instead of being uniformly brighter, was made up of a series of bands, alternately dark and rainbow colored. When either of the two holes was covered, the bands disappeared. Here were phenomena unexplainable by any theory other than that light is a wave motion. Two sounds added may produce silence, two water waves added may neutralize each other, and Young had succeeded in demonstrating that precisely the same thing is true of light.

A curious fact had been pointed out by Robert Boyle over a hundred years before Young was born. This phenomenon, afterwards known as "Newton's rings," a series of colored rings produced when two films of glass are pressed tightly together, could not be explained by any twistings or turnings of the corpuscular theory. Young boldly announced that the rings as well as the beautiful, mysterious colors of soap bubbles, were the direct result of the interference of light waves. Ordinary white light, as will be shown in a later chapter, is made up of a multitude of wave lengths, each wave length being a color. When white light strikes the curved surface

One of the Most Brilliant Men in History. He Proved That Light Travels in Waves

of a soap bubble, some of the colors are reflected from the outer surface of the film; others penetrate to the under side of the same film and are there reflected, following the first train of waves, and separated from them only by the tiny distance of the thickness of the film. Since the brotherhood of colors known as white light is thus broken up by the two reflections, the brilliant colors of the bubble are accounted for, and likewise, those of the "rings."

Only one point remained to be cleared up. Newton's chief objection



Young's Experiment Which Demonstrated the Wave Theory of Light

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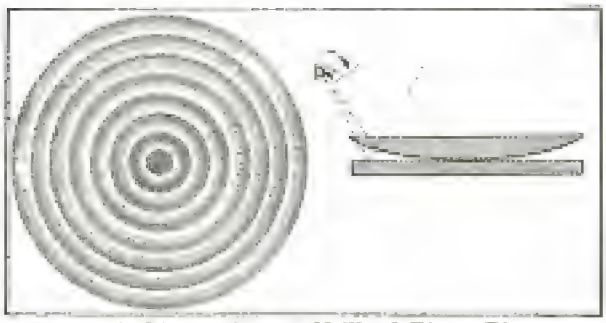

Newton's Rings. Young Utilized These Rings to Prove His Theory

to the wave hypothesis was based on his belief that the so-called light waves could not go around corners, like sound waves or water waves, and that therefore light could not be a wave system. Grimaldi, nearly a century and a half before, had noticed and described the "light and dark fringes at the edges of shadows of small opaque bodies placed in the path of sunlight admitted through a small hole." This phenomenon was termed "diffraction." It can readily be observed in looking through a feather at a strong light. In 1815, Fresnel, a brilliant young French scientist, demonstrated beyond doubt that diffraction is really a bending of the light waves, produced by interference. The last objection to the undulatory theory of light had been answered, and since then it has taken its place as an accredited tenet of science.

AERIAL EXPRESS PICKING UP THE MAIL

An artist of the London Sphere, looking into the future with largely imaginative eyes, sees an aeroplane mail express picking up the mails from a high tower in somewhat the same manner as in practice on railroads. At the top of the tower is a swinging contrivance consisting of a horizontally mounted revolving shaft controlled by hydraulic buffers. The mail bags are suspended from the shaft by rings, and the aeroplane is fitted with a projection, which, in coming in contact with the bags, sweeps them from the shaft and drops them into a net placed suitably to receive them.

An Aeroplane, Rushing through the Night, Picks Up the Mail from a High Tower without Stopping

The article accompanying the illustration says, that, granting that aeroplanes will in the not remote future be much larger and heavier and able to steer with much greater precision, the prediction is quite a feasible one.

BALTIMORE HAS MONSTER STORAGE BATTERY

The monster storage battery recently installed in Baltimore, Maryland, as insurance against interruption in the city's electric light and power service, is said to be the largest ever placed in one plant in the world.

The installation of the battery cost about $400,000, which includes the cost of the special building erected for it. The battery weighs 616½ tons, and required 14 tons of copper to make the necessary connections. When

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Huge Baltimore Storage Battery, Weighing 616½ Tons, and Requiring 14 Tons of Copper to Make the Connections, in the Special Building Erected to Contain It

accidents occur which necessitate the shutting down of one of the stations for short periods, the battery will automatically supply current, with no break in the service.

POTASH FROM SEAWEEDS

In a recent report of Secretary Wilson, of the Department of Agriculture, the statement is made that the kelp beds that border the coasts of California, Washington and Oregon are capable of supplying 1,000,000 tons of chloride of potash annually, worth at least $35,000,000. That is about three times the value of the potash salts now imported each year from Germany, for the use of American fertilizer manufacturers. It appears, therefore, that the hitherto neglected harvest of the sea constitutes a national resource of very great monetary value, capable of relieving American farmers from the necessity of further dependence upon foreign sources of supply for a necessary constituent of all commercial fertilizers.

Secretary Wilson's report is based upon investigations made by scientists of the Bureau of Soils, who operated with a special appropriation of $12,500 granted by congress a year ago. These have mapped and studied kelp groves, extending from Puget Sound to Point Loma, with a total area of about 100

Kelp Cast Ashore after a Storm on the California Coast—Government Scientists Declare That Potash can be Secured from It, Thus Freeing Us of Dependence on the German Sources

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square miles. However, they state that they have mapped and examined but a portion of the kelp beds off the Pacific coast, so that the annual supply of potash salts available from the seaweed harvest is much greater than stated. The kelp beds so far examined vary in extent from less than an acre up to stretches five miles in length and two miles or more in width. The investigations made by the Bureau of Soils constitute the first serious attempt that has ever been made to ascertain their extent, character and possible uses. Heretofore they have been considered devoid of economic value, except as they supplied food to the fishes of the Pacific.

One company has been organized at Coronado, Cal., for the extraction of potash salts from seaweeds. A boat has been built, with specially designed machinery for the harvesting of the kelp. However, the plans of the company have been kept secret, and little is known of the methods it will employ. Whether the government will permit the indiscriminate harvesting of the kelp beds, or whether this new resource will be safeguarded by restrictions, to prevent the possible destruction of the forests of the ocean, is an interesting question.

Twenty-Three Women in a German Swimming Tank Floating in a Star Formation

STAR FORMED BY WOMEN SWIMMERS

A woman's swimming club at Augsburg, Germany, frequently gives swimming exhibitions in which novel and interesting feats are accomplished. In the accompanying illustration 23 women are shown floating on the surface in a star formation.

DISEASED TISSUES TREATED WITH RADIUM SALVE

The application of radium in treating diseased tissues is difficult in a great many cases because of the location or seat of the disease and the necessity of repeated treatments, but in order to provide for such cases, a New York radium specialist has devised a radium gelatine. This is a sterilized solution of a gelatine which

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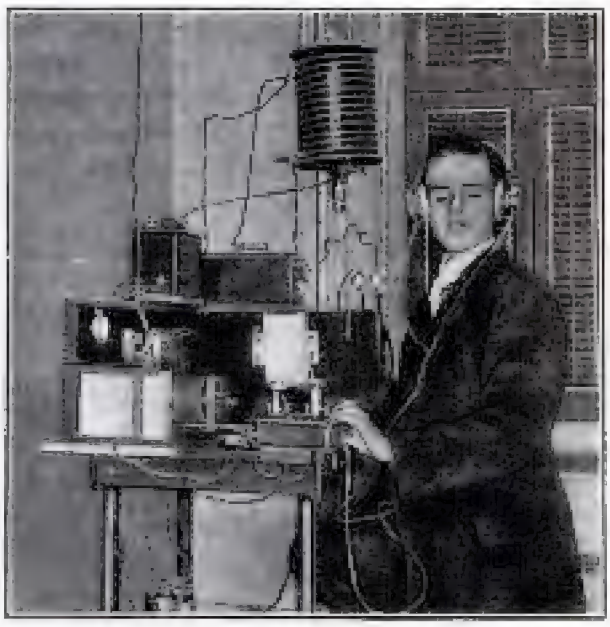
contains a small quantity of radium and which will coagulate when it becomes cold. Before becoming cold, however, it is charged with as large a quantity of emanations as possible. The coagulated solution is heated several times, thereby liquefying it, and each time it is again charged with emanations, so that there is finally obtained a radioactive product which contains primary as well as secondary radioactivity.

The radium gelatine or salve is injected into the diseased parts in liquid form or is applied by means of tampons, etc. Tests are said to show that it is readily absorbed by the surrounding diseased tissues.

THE ONLY BLIND WIRELESS OPERATOR

John Ellis, of Providence, Rhode Island, is said to be the only sightless wireless operator, and his success is believed to open a new field for the blind. The operation of a wireless outfit depends on hearing alone, and the idea held by some people that the wording of a message is read by the sparks is erroneous. The operator sits with telephone receivers at his ears and hears the ticking of the message.



A Sightless Wireless Operator, Claimed to be the Only Blind Man So Employed, Receiving and Transmitting Messages

SIGN SPACE RENTS FOR $60,000 A YEAR

In this illustration is shown a six-story building at the northwest corner

The Sign Privileges of This Building are Valued at $60,000 a Year, Which is $20,000 a Year More than the Building is Leased For

of Broadway and 34th Street, New York, which receives $20,000 a year more for the signs it carries than for its store and office rentals. The building is leased for $40,000, and the sign privilege yields a rental of $60,000 a year.

The frontage of the property is but 31.10 ft., and the area covered is not more than half of a full city lot, yet it was recently sold for $1,000,000, which is about $866.55 a square foot, making it one of the most valuable pieces of land in the world.

President Madero of Mexico made a four-minute flight in an aeroplane recently at Mexico City as a passenger with George M. Dyott. This is the first time that the actual head of a nation has ever gone into the air on an aeroplane.

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OIL PROSPECTORS FILE ON RESIDENTIAL PROPERTY

When a man buys a house and lot in a city of more than 300,000 population, he naturally feels that he is safe from such attacks on his property as are usual in new mining districts; having mining claims filed upon his ground, and prospectors attempting to dig for minerals in his front lawn.

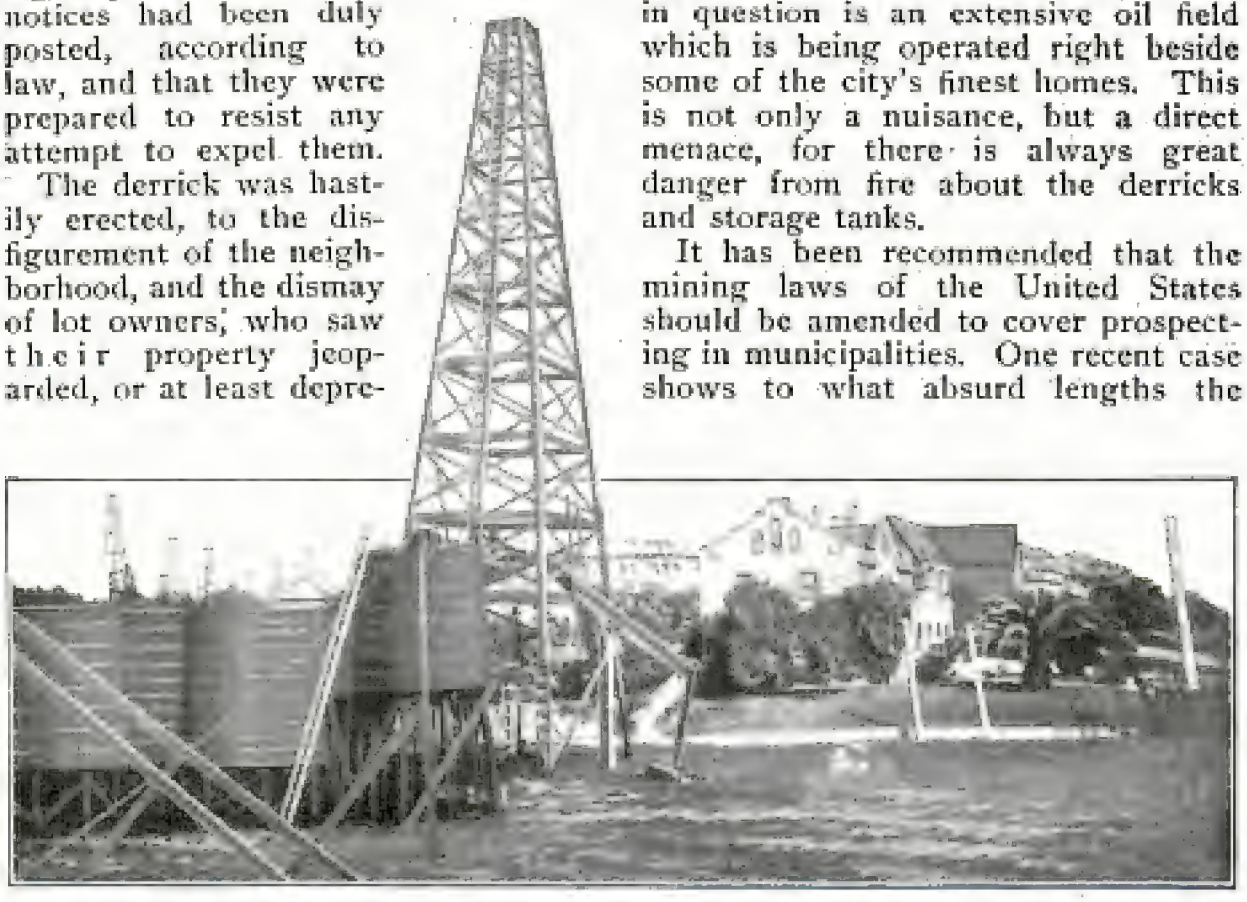
A case has just come up in Los Angeles, however, which points that ancient moral that a real estate purchaser should make sure of his title from the beginning of all records. It seems that a wealthy widow, who owns a tract of improved land in one of the most fashionable residential districts of Los Angeles, woke up one morning to find a gang of laborers erecting an oil derrick on her property, not far from her home. On asking for an explanation, she was told that the quarter section of land which comprised her tract had been filed upon by eight prospectors, that notices had been duly posted, according to law, and that they were prepared to resist any attempt to expel them.

The derrick was hastily erected, to the disfigurement of the neighborhood, and the dismay of lot owners, who saw their property jeopardied, or at least depreciated in value by the proximity of an oil field. Legal advice was sought, and the status of the case was declared to be as follows: The land had been originally granted to the Southern Pacific Railroad in 1879, but like the other railroad grants, this one exempted mineral lands from the patent. At that time the land was not known to contain oil, and as far back as 1884 it was sold to an innocent purchaser. From him it passed to his widow. Now the mining men hold that inasmuch as mineral land is not included in the grant, the quarter section is still government land, and as such, open to prospectors.

There is some doubt as to whether the city has an ordinance against drilling wells in the city, but even so, the federal law would stand against any city regulation. While litigation is expected, the matter may be compromised out of court.

Not more than a mile from the land in question is an extensive oil field which is being operated right beside some of the city's finest homes. This is not only a nuisance, but a direct menace, for there is always great danger from fire about the derricks and storage tanks.

It has been recommended that the mining laws of the United States should be amended to cover prospecting in municipalities. One recent case shows to what absurd lengths the



Oil Claim Made on Residential Property in Fashionable District of Los Angeles

present law can be stretched by literal interpretation. A party who claimed to have found gold near the surface, tried to stake out a placer mining location on the site of the Arcade Railway station, the most important depot in Los Angeles.

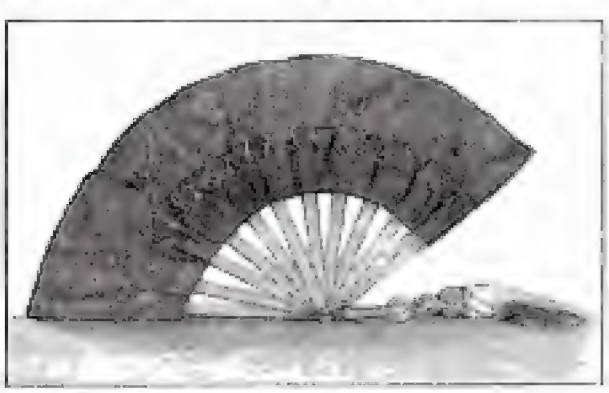
OLD CUP DEFENDER GIVEN CONCRETE REINFORCING

One of the old defenders of the American Cup, the "Pilgrim," has been converted into an auxiliary schooner by its owner, John A. Royall, and will be used in research and experimental work on the southern coasts, gathering data for the development of the southern fisheries.

The reconstruction of the sloop was unique, the thin steel plates of her hull being reinforced with concrete. The concrete at the keel is 6 in. thick at the stem, 14 in. thick amidships, and 8 in. thick at the stern, graduating upward into wings between steel frames, and tapering to 2½ in. in thickness at the water line. The dimensions of the "Pilgrim" are, length over all, 128 ft.; beam, 26 ft.; draft, 6½ ft. She has no topmasts and all sails are inboard. Her auxiliary power consists of two 4-cylinder, 35-hp. heavy-duty engines.

LIVE-FLOWER FANS

The latest fad in Paris is a fan that can be covered or decorated with all sorts of real flowers. When folded, it appears to be a simple bouquet. The manner of attaching the flowers and



The Real-Flower Fan Ready to be Covered with Flowers

The Fan as It Appears When Covered

leaves, by means of flexible covered wires, is shown in one of the illustrations, while the other shows the effect when covered. New flowers are, of course, attached to the fan each time it is used.

AUTOMATIC DEVICE CHECKS RAVAGES OF SHIPWORM

An inventor of Long Beach, Cal., has designed an automatic device for the protection of partially immersed wooden piles from the ravages of parasites. The contrivance consists of a floating collar and connected rings encircling the pile which by waves and tide are given horizontal and vertical variations of position in such a manner as to result in a continuous friction against the wood. This is supposed to prove fatal to all animal life attached.

Ordinarily the life of a pile set into the salt water of the Southern California coast varies from three to six years. The inventor claims that his device will prolong this period of usefulness from 50 to 100 years, depending upon other conditions.

The most destructive pest of the Pacific is the teredo or shipworm, a mollusk which attacks timbers in the water between high and low-tide lines and bores its way into the wood. In 1731 and 1732, the same sort of teredo now playing havoc here created national alarm in Holland by boring into the piles constituting part of that country's defense against the inroads of the sea.

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RESULT OF A DOUBLE EXPOSURE

In his photographic enthusiasm, the father of the baby shown in the accompanying illustration made two

This is Not Twins, but the Same Baby Appears Twice Because of a Double Exposure

exposures without changing the plate, and as a result the baby appears twice, once in a natural position for babies of its age and once floating in the air just outside the railing of the porch.

ROAD BUILT ACROSS A COUNTY IN A DAY

A remarkable demonstration of what may be accomplished in road-building by the right kind of coöperation has been given by the residents of Lincoln county, Oklahoma, who constructed a road 33 miles long, from the east to the west boundaries of the county, in one day. Several weeks had, of course, been devoted by the leaders to making arrangements, but the actual road-building was accomplished in eight working hours, 3,000 men and 2,000 teams being utilized. Half or one side of the road is constructed of hard surface and the other half or side of dirt, thus furnishing a base for motor cars on one side, and for the unshod horses of the farmers on the other.

The road-making day was in the nature of a holiday in the entire county. All business in Chandler, the county seat, was suspended, and merchants, bankers, professional men and artisans reported for work. All stores, factories and schools in the other towns were also closed by proclamation. At noon the women of the county served a vast dinner, and, as hot food was served along the entire line of the road, it is no exaggeration to say that the dining table or roadside used as such was 33 miles long. Boiling pots of coffee were available every sixteenth of a mile. The greater number of the men were unfamiliar with the handling of teams, scrapers, shovels and dynamite, but capable bosses were in charge of all sections of the road, and the construction was carried out without a hitch.

PORTLY LOBSTER GENTLEMAN IN SHOP WINDOW

This curious representation of a portly gentleman is made entirely from a lobster, even to the pipe and walking-stick. It is exhibited in a London shop window, where it provokes much amusement.

¶A process has been recently discovered by means of which banana stocks can be subjected to a process which squeezes out the juice and shreds the fiber, the result being a substitute for cotton waste.

United States Cotton-Standard Laboratory at the Department of Agriculture; Experts on Balcony can Detect Slightest Difference in Color at This Elevation

GOVERNMENT EXPERTS FIX COTTON STANDARD

A system for the standardization of cotton which eliminates the inaccuracy connected with the usual methods of grading is a recent achievement of the Bureau of Plant Industry of the Department of Agriculture. By determining the average length of fiber of the cotton to be graded, the government experts in Washington have hit upon a scheme which they believe will revolutionize the present methods of buying and selling and benefit both the grower and spinner.

Heretofore the grading of cotton was purely a matter of guesswork. The accuracy of the work depended upon the judgment of cotton experts. If an expert wished to favor the buyer by cheapening the grade of the cotton to be examined, it was only necessary for him to jerk it apart, thereby snapping the fibers and causing them to appear short.

Standardization, according to the new method of the bureau of plant industry, is accurately accomplished by smoothing out 50 or 100 cotton fibers in the usual manner and then separating them under a microscope. The individual fibers are then placed between two pieces of clear glass, thus forming a lantern slide. By placing this slide in a solar camera fitted with a powerful electric light each fiber is magnified about 20 times and reproduced on a large glass screen directly in front of the projecting apparatus. The operator making the standardization then takes a rotary map measure and measures the length of each fiber. These lengths are then tabulated on an adding machine until the lengths of from 100 to 200 fibers have been determined. The total length is then found and an average computed. Upon this average length the standardization is based. The government experts say that this system of grading

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Measuring Cotton Fibers. Projection Lantern in Rear of Screen

Glass Blower at Work Placing Samples of Standard Cotton in Vacuum Tubes

can be accomplished at a cost of about $2 for each sample.

Previous to two years ago, when the government experts first took up the matter, it was almost impossible to preserve the standard samples of cotton. Storing them away in a dark room prevented color changes as the result of the action of the light, but oxygen and other gases in the air caused a change in appearance which made all accuracy impossible.

After a series of experiments, it was found, however, that if the samples were kept in a vacuum, no changes in their appearance would take place, no matter how long they were stored away. The most convenient way in which to keep the samples in a high vacuum was to seal them in glass tubes. The standard grades are now being put in these tubes daily, to be broken open from time to time so as to insure the consistency of the official grades of this country.

AEROPLANE AUCTIONS IN FRANCE

Several aeroplane auctions, both voluntary and forced by creditors, have taken place in France in the past several months, and the prices obtained for complete machines and for accessories have been remarkably small. In one instance a propeller of first-class make brought less than one dollar, and a monoplane, without motor, was sold for $35. A complete machine, motor and all, in good order, brought only $60.

The life of an aeroplane, even though it meets with no serious accidents, is short. French papers speak of a Farman biplane, which has been in service only a year, as a veteran of its type.

LONGEST-STROKE AUTO ENGINE

The engine used in an automobile of English make in a recent hill-climbing test, which the car won, is said to have one of the longest, and in all probability the longest, strokes ever employed in a motor car. The bore is 3.35 in. and the stroke 10.64 in., which makes the ratio of stroke to bore approximately 3:1. The top of the engine bonnet is shoulder-high to an average man.

"It is safe to state," says Motor, "that for any practical purpose, not excepting that of racing, the bounds of stroke length have been passed in this engine. It is hard to see what purpose is served by such an engine, unless it be an experiment to establish by a cut-and-dry method the limit beyond which one cannot go."

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WAYS MISSING SHIPS MAY HAVE BEEN LOST

By Foundering after a Storm

By Tidal Wave

By Waterspout

By Capsizing

An interesting series of pictures, depicting the probable manner in which ships posted as missing at Lloyd's were wrecked, was published recently in the Illustrated London News. Four pictures of the series are here reproduced, showing ships foundering after a gale, caught by a tidal wave, overwhelmed by a waterspout, and capsized by some convulsion or other.

During the first three months of last year 144 steam and sailing vessels were lost at sea, and of these, 13 were posted at Lloyd's as missing, their fate being conjectural.

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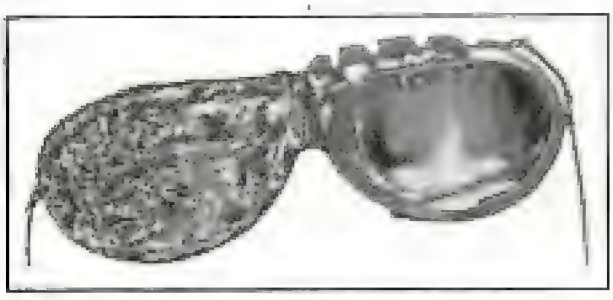
GOGGLES AS PROTECTION FROM FLYING METAL

The use of goggles by workmen employed at tasks in which there is a possibility of the eyesight being de-



Showing the Protection Afforded by Goggles, One Side of Which is Completely Covered with Babbitt Metal Which would have Destroyed the Eyes had the Goggles Not been Worn

stroyed by flying metal, is one of the protections provided in modern steel plants, the importance of which, strange to say, it is difficult to impress upon the men. Every morning in one plant, for instance, the foremen of certain departments make sure that each man has a perfect pair of goggles, and call his attention to the necessity of wearing them. Most of the men do wear them, according to Robert J. Young, safety inspector of the Illinois Steel Company, but on their hats.

An example of the protection afforded is shown in the illustration, one side of the goggles being completely covered with babbitt metal. The metal exploded while the wearer of the goggles was pouring it, but he received merely a slight burn about the face. His eyesight would probably have been destroyed if he had not been wearing the goggles.

BERLIN'S NEW POLICE TELEPHONE SYSTEM

A new and very interesting telephone system has been installed by the police department of Berlin to facilitate the calling of branch stations and headquarters. All the members of the department, uniformed and secret service, are provided with pocket telephone sets so compact as to be easily carried in the pocket or in a small leather holder attached to a strap. Contact stations are scattered over the city, on fence posts, on the walls of buildings, and on trees in the parks. The connection is established by merely plugging the contact station.

A TRAIN-ILLUMINATION INSTRUCTION CAR

To the list of special instruction cars usually maintained by railroads for the benefit of their employes, the Pennsylvania system has added a train-lighting car. This railroad system utilizes no less than eight distinct axle-device systems, in addition to a large number of straight storage equipments, and an instruction car was deemed necessary in order to furnish uniform instructions to yard electricians. The car will be sent to the different points at which electrical forces are maintained, and the men at such points will be given lectures and demonstrations on the operation and maintenance of the various systems.

A COLUMBARIUM MONUMENT

The monument shown in the accompanying illustration is similar in size and design to those usually placed in the center of a family burial lot, but it serves as a columbarium as well as a monument. The ashes of the cremated dead are placed in urns, which are kept in a receptacle back of the metal grating.

¶A large electric motion sign, 65 ft. wide and 50 ft. high, using more than 3,000 5-watt lamps, advertising electric vehicles, has been erected at Broad and Market Streets, Newark, N. J.

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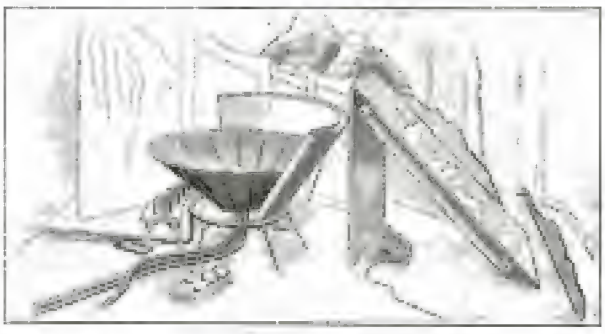
VOLCANIC ERUPTIONS ON THE STAGE

The sequence of phenomena characterizing a volcanic eruption is usually subterranean grumblings followed by smoke, which at first seems to hesitate at the edge of the crater and then rises in the air. The smoke is succeeded by streams of lava, the projection of rocks and ashes, and often vast outpourings of flame.

To reproduce such a scene on the stage of a theater would seem a rather difficult, complicated, and dangerous undertaking, but it has been accomplished in a particularly vivid manner in a French theater with the simple apparatus shown in one of the illustrations. Concealed behind the scenery representing the crater of the volcano is a stand, from the center of which rises a funnel of wire screen, about 13 ft. in diameter, connected with a compressed-air supply by three tubes. Below the funnel is a circular metal tube provided for about half of its circumference with a steam ejector, which rises above the wire-screen funnel. Attached to the circular tube is a hose or tube connecting it with a source of steam supply behind the scenes.

The portion of the crater seen from the body of the theater is formed of transparent material, and behind this an endless belt is set in motion, lighted from behind by a cluster of 24 red lamps. This belt, which is shown at the right of the illustration, is also transparent, and is so decorated that, as it is revolved above the red lights, it imitates the flow of lava. Sponges, painted red or gray, to represent glowing or dark rocks, and pieces of paper, to represent ashes, are thrown into the funnel-like receptacle by men concealed in the scenery, and are then thrown as high as 18 or 20 ft. by the compressed air. Bengal fires lighted in pans on each side of the crater serve to give the effect of leaping flames, smoke-producing tablets, placed just back of the funnel serve to add smoke to the steam; subterranean thunder is supplied by men beating drums and the operation of other noise-producing apparatus, and illumination is thrown down into the crater from reflectors arranged above the stage.

A Volcano Reproduced on the Stage of a French Theater



The Ingenious Apparatus by Means of Which the Effect is Produced. Sponges and Paper are Blown from the Funnel to Imitate Rocks and Ashes, Steam Rises from an Ejector, Fire Flames from the Fire-Pans, and Flowing Lava is Imitated by Turning a Scenic Belt

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¶All Isthmian records of excessive rainfall for short periods were broken at Porto Bello recently by a fall of 2.46 in. in three minutes. The highest previous record was 0.75 of an inch in five minutes at Rio Grande in July, 1908.

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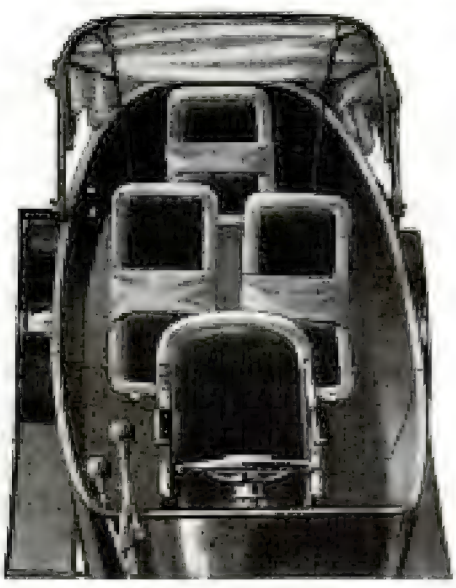
GERMAN MOTOR-CAR HAS HAMMOCK SEATS

A German maker of automobiles is equipping several cars with suspended seats, the frames of which consist of

Hammock Seats for Automobiles, Constructed by a German Concern

strong metal springs. The seats are mounted on a kind of metal sled, on which they may be slid from place to place in the car body. Two, three, four or five seats may be used, to suit



A Car Body Provided with Four Hammock Seats

the convenience of the owner of the car. In one of the illustrations four seats are shown.

It is claimed that a passenger rests in one of these seats as in a hammock, the body having no fixed position, but changing when the speed is suddenly slackened or sharp curves are turned.

INGENIOUS MACHINE FOR CUTTING ASPHALT

A motor-driven trenching machine, capable of cutting out in one day from 900 to 1,200 linear feet of asphalt and concrete pavement preparatory to the sinking of ditches for sewer and water pipes or electric conduits, was recently demonstrated in the streets of Washington, D. C. It is claimed that the machine, which can be operated at the cost of about $15 per day, can accomplish more cutting in that time than can 45 to 60 laborers armed with picks and crowbars.

This trenching machine is constructed almost entirely of steel and resembles a huge road roller. It is operated by a 40-hp. gasoline motor. By means of a series of gears the power from this motor, besides being conveyed to the tractor wheels, is also conveyed to an apparatus resembling a pile driver which is fitted to the rear end of the machine.

This apparatus consists of two board lifts fitted with heavy cutting knives which are so arranged that the distance between them can be varied from 1 to 3 ft. according to the desired width of the trench to be dug. The cutting knives are operated alongside of two heavy shoes which are pressed down against the pavement with great force, thus preventing any crumbling of the edge of the asphalt outside of the trench, and insuring a clean cut. The knives can be operated in unison or alternately, and the force with which they hit the asphalt can be varied from 350 to 2,500 lb. Three blows in the same spot are usually required to cut the asphalt. The peculiar construction of the knives causes the asphalt to be swaged up in the center and entirely loosened from the concrete base.

The cutting of the pavement is done in two operations. The machine first

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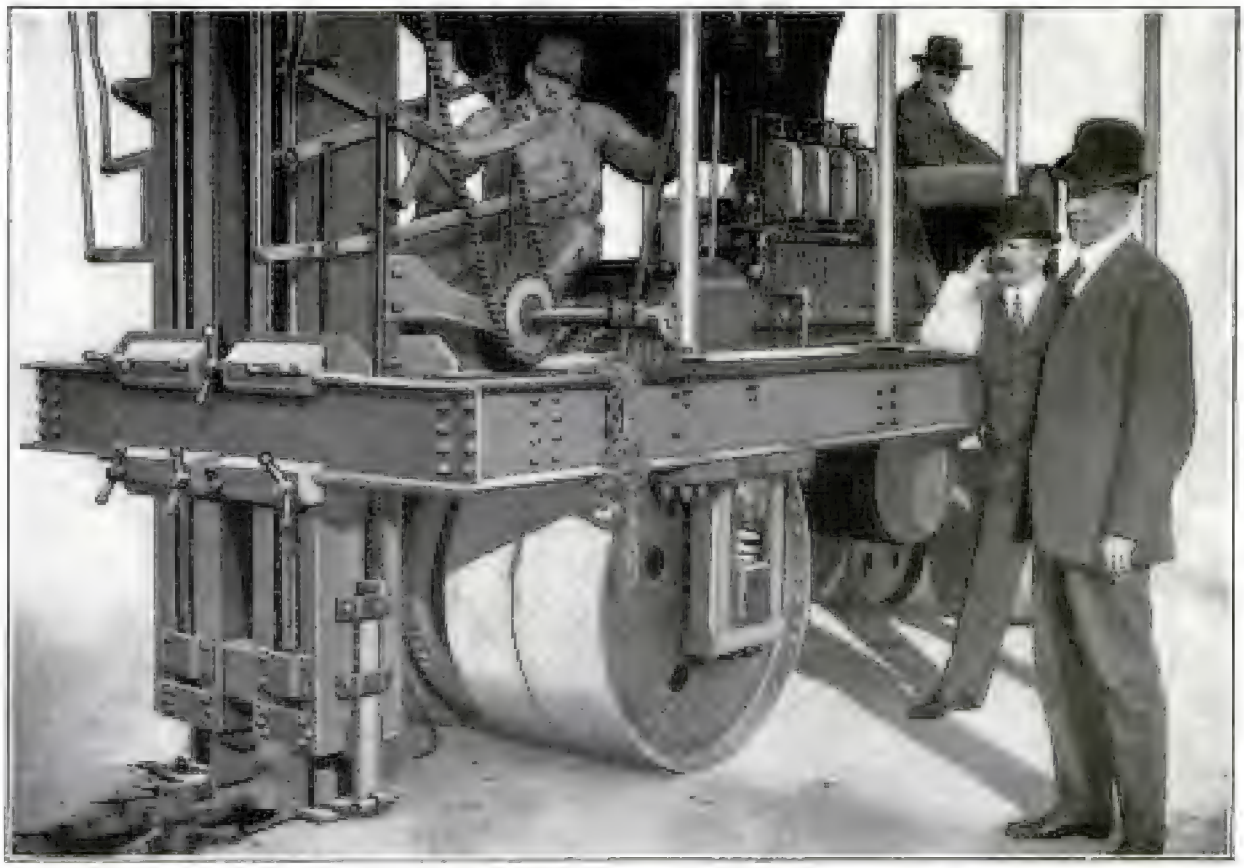


A Motor-Driven Machine Which Cuts Asphalt and Concrete Pavement, Doing the Work of 45 to 60 Laborers Armed with Picks and Crowbars

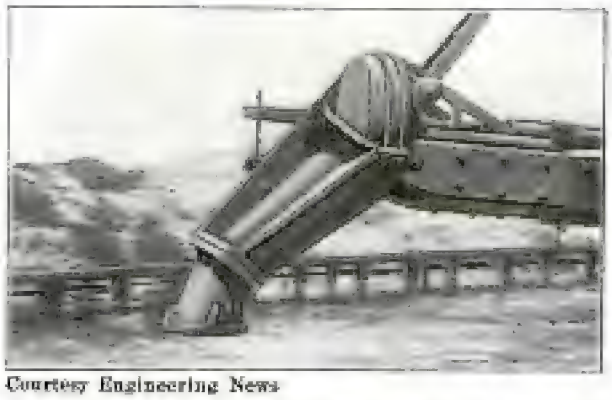
cuts away the asphalt surface. This is accomplished at the rate of from 5 to 7 ft. per minute. After the broken asphalt has been removed the machine then passes over the ground a second time and cuts away the concrete foundation or base.

During this second operation a heavy hammer is brought into play which crushes the concrete into rubble so that it can be used again when the trench is resurfaced. The cutting of the concrete is a slower operation, yet 3 to 5 ft. can be cut per minute.

HYDRAULIC DREDGE SAVES IMPERIAL VALLEY CROPS

The irrigation troubles in the Imperial Valley, lower California, due to the silt carried in the Colorado River water, which was continually obstructing the flow of water in the Imperial Canal, have been finally solved, and, it is believed, successfully, by the operation of a suction dredge.

The lack of available water in 1910, due to the deposits of silt, was so threatening to the entire crop of the valley, that appeal was made to the War Department for permission to construct a diversion weir in the Colorado River below the canal intake, as the only means to save the valley. President Taft was appealed to, to use his influence with the War Department in this emergency, and permission was obtained for such a



Courtesy Engineering News

The Suction Nozzle of the Dredge Acquired at a Cost of $63,589 to Remove the Silt from the Imperial Valley Irrigation System

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weir on condition that it be only temporary. Work was rushed and upon September 1, 1910, the water level was thus artificially raised, but by that time more than $1,000,000 of damage had resulted to the crops because of the lack of water. The success of the temporary weir gave rise, for a time, to the idea that the removal of such a weir before high water, and re-installation thereafter each year, was the only remedy for the Imperial Valley, but the cost was shown to be too high, and the use of a hydraulic dredge having a 15-in. pump was finally decided upon.

The dredge was built during the winter of 1910-11, at a total cost of $63,589. Its operation last year is said to have proved entirely successful, solving the silt problem, and saving the 1911 crops of the valley, which were worth several million dollars.

RIVER BOATS DRIVEN BY AERIAL PROPELLERS

Aeroplane motors and propellers built by one of the big monoplane-manufacturing concerns of France are being tested on shallow-draft river boats intended for navigation in the French colonies. The shallowness of the colonial inland rivers and the vast amount of vegetation in the water make the ordinary submerged propeller impracticable.

COLOR AND THE FISHES

The scientist, C. Hess, in making a study of the color vision of fishes at the zoological station at Naples, Italy, finds that for certain fish, both of salt-water and fresh-water varieties, the brightest point of the spectrum lies between yellowish green and green. The yellowish red and red rays of the spectrum had only a small value of brightness for the fishes experimented with.

In several experiments one-half of the basin was illuminated by red and the other half by blue light, and, although the red would appear distinctly brighter than the blue to human eyes, the fish gathered in the blue. It is said that the relative brightness in which the examined fish see the various parts of the spectrum coincides with that in which the totally color-blind man sees them.

Shallow-Draft River Boat Driven by Aeroplane Propeller in Tests being Made in France

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A Theatrical Production on Skates at the Ice Palace in Berlin

A BALLET ON SKATES

Berlin has a huge ice palace in which, aside from the ordinary skating of the general public, are produced many unique-feature entertainments. One of the most unusual of these was the staging of a theatrical production called "The Harem Feast," everything being carried out as it would be in an ordinary theater, excepting that the participants were on skates. The illustration shows the scene in which the "veil dance" was given on an iced section corresponding to the stage of an ordinary theater.

INVERTIBLE ELECTRIC FRYING-PAN

The electric-cooking utensil here shown is not only a complete frying-pan, capable of cooking anything that can be fried in the ordinary manner, but also becomes a disk stove, suitable for all kinds of light cooking, toasting, etc., by simply inverting it. The pan is made of sheet steel, and the heating element is located in the bottom, hermetically sealed between steel walls so that it is completely protected from oxidation. It can be operated at three temperatures, high, medium, and low, the desired temperature being obtained by means of an indicating push-button switch.

Electric Frying-Pan Used as Such

Inverted for Use as an Electric Disk Stove

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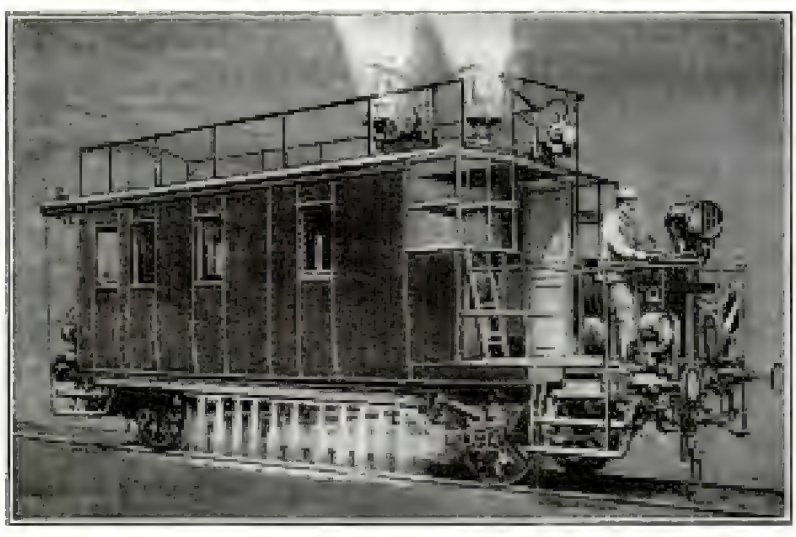
The Aero Club of France recently instigated a competition among sculptors for a design of a projected monument in glorification of the achievements of the French in aviation. The prize was awarded to Ernest Dagonet for the group shown in the accompanying illustration.

REINFORCED-CONCRETE PAVEMENT

A reinforced-concrete pavement constructed in Plymouth, Wis., about 18 months ago has passed through one winter and more than half of another without showing the sign of a crack or a flaw, even along the street car tracks. The three interesting features of construction in the laying of this concrete pavement were the use of cypress for expansion joints, a new form of rough surface, and a reinforcement of woven wire mesh. In place of the usual asphaltum or tar expansion joints, 1 by 8-in. cypress boards were used along each gutter and every 4 ft. across the street. The surface finish coat consisted of crushed granite chips ranging in size from ¼ to ¾ in. in diameter, granite screenings from ¼ in. down to dust, and Portland cement mixed in a proportion that would give the densest mixture. The wire-mesh reinforcing was placed directly on the base concrete, so as to lie between the surface and the base.

MOTOR ILLUMINATION CAR FOR SWISS RAILWAY

A self-contained illumination car, intended for service at night or in tunnels, for construction and inspection work, has been installed by one of the Swiss railways. It is a converted old-style passenger car equipped with a gasoline engine, which drives a dynamo furnishing current for motive power and illumination.



Self-Contained Motor-Driven Illumination Car Used in Construction and Inspection of Tunnels or for Night Work on a Swiss Railway

In addition to the searchlight, the car is equipped with six arc lamps and two rows of incandescent lamps. The searchlight is mounted in front on a fixed pedestal, or on a movable pedestal which may be placed at either side of the platform or on the roof. The two arc lamps on the roof are attached to a revolving support and are provided with reflectors below to facilitate inspection of the roofs of tunnels,

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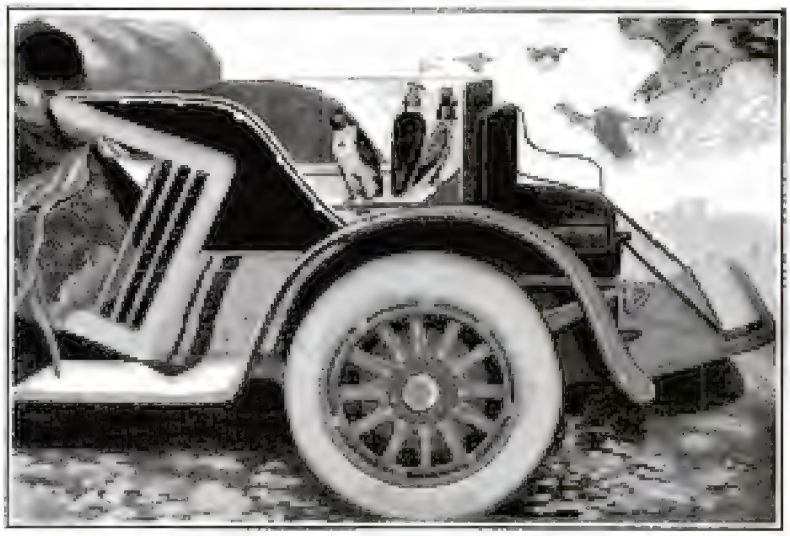
while the four other arc lights may be disposed in different positions. The two rows of incandescent lamps are stretched along under the car, one row on a side, and above each row is a long reflector designed to throw the light downward for the inspection of the rails and roadbed.

FALCONRY BY AUTOMOBILE

A European huntsman, who still enjoys the ancient sport of falconry, which is the sport of capturing wild fowl or game by means of falcons or hawks, takes his falcons to the vicinity of the hunt in an automobile having a specially constructed body for their accommodation. Until the moment the falcon is released for its flight to capture some other bird, its head is inclosed in a hood. Three hooded falcons are shown in the automobile.



Falcons Taken to the Scene of the Hunt in a Specially Constructed Automobile

BAYONET PRACTICE ON DRESSED BEEF

Punched steaks, perforated steaks, and punctured stews will be the fare of Uncle Sam's soldiers henceforth, if the recommendations of two army officers who have been revising the manual of bayonet practice are accepted.

In a recent report, Gen. Leonard Wood, chief of staff, stated that the present bayonet drill in the army was nothing less than a farce and recommended that henceforth the soldiers be put through a drill that has some actual value. Accordingly there have been many suggestions regarding bayonet drills, but the recommendation of the two officers who are revising the manual is the most novel. There has been much speculation regarding the probability of its adoption.

These officers declare that there is too little realism in the life of a soldier to make him a good fighting man, and therefore recommend that they use dressed beef as a target in practicing thrusts with the bayonet. Not until the soldier has actually felt his bayonet plunge into raw meat and learned to withdraw it from real flesh, in readiness for another deadly jab, will he be ready to carve up the enemy on a field of battle, these officers declare.

There would be no additional expense attached to this practice, it is said, because the sides of beef used for bayonet practice could be borrowed from the company kitchen, and returned after the bayoneteers had finished with them. Clean bayonets, it is added, will be sufficient protection of the stomachs of the men who are to eat the beef.

Thus far the suggestion of these two officers has not met with any markedly enthusiastic reception.

¶The United States government has purchased 200,000 lb. of chewing and smoking varieties of tobacco for its seamen in all quarters of the globe. This is the largest purchase of the weed ever made by the government.

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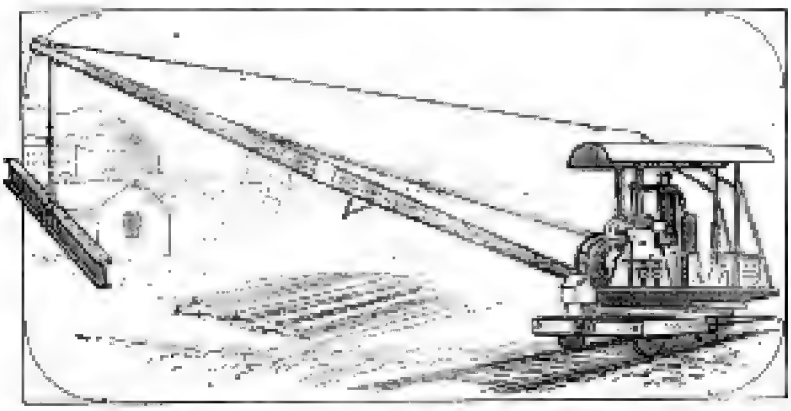
LONG-ARMED TRACTION CRANE FOR YARDS

A long-armed electrically propelled crane of light construction for use in factory yards, where it may be run from point to point, is being placed on the market. It is operated by one man, has a maximum lifting capacity of 15 tons at a 10-ft. radius, and 2.5 tons at the 40-ft. radius, and the drawbar pull is about 7,600 lb., which enables it to handle six or seven cars on a level track.



A Long-Armed, Self-Propelled Electric Yard Crane

EFFECT OF SWITCHING ON METAL FILAMENTS

Prof. E. W. Marchant of Liverpool (Eng.) University, and Prof. W. Parry have proven by experiment that there is practically no change in the useful life of metal-filament lamps due to the effect of switching. Although it was found that 72,000 switchings reduced the life of the lamps about 33 per cent, and that the effects of the switchings, as indicated by the results of the experiment, seemed to be accumulative and directly proportional to their number, nevertheless the number of switchings that would occur in ordinary use would produce only a very small effect. For if the useful life of the lamp be taken as 1,000 hours, and it be assumed that they are switched once every hour, then the effect of switching them on and off 1,000 times will be equal to 1,000 ÷ 72,000 parts of 33, or .46 per cent.

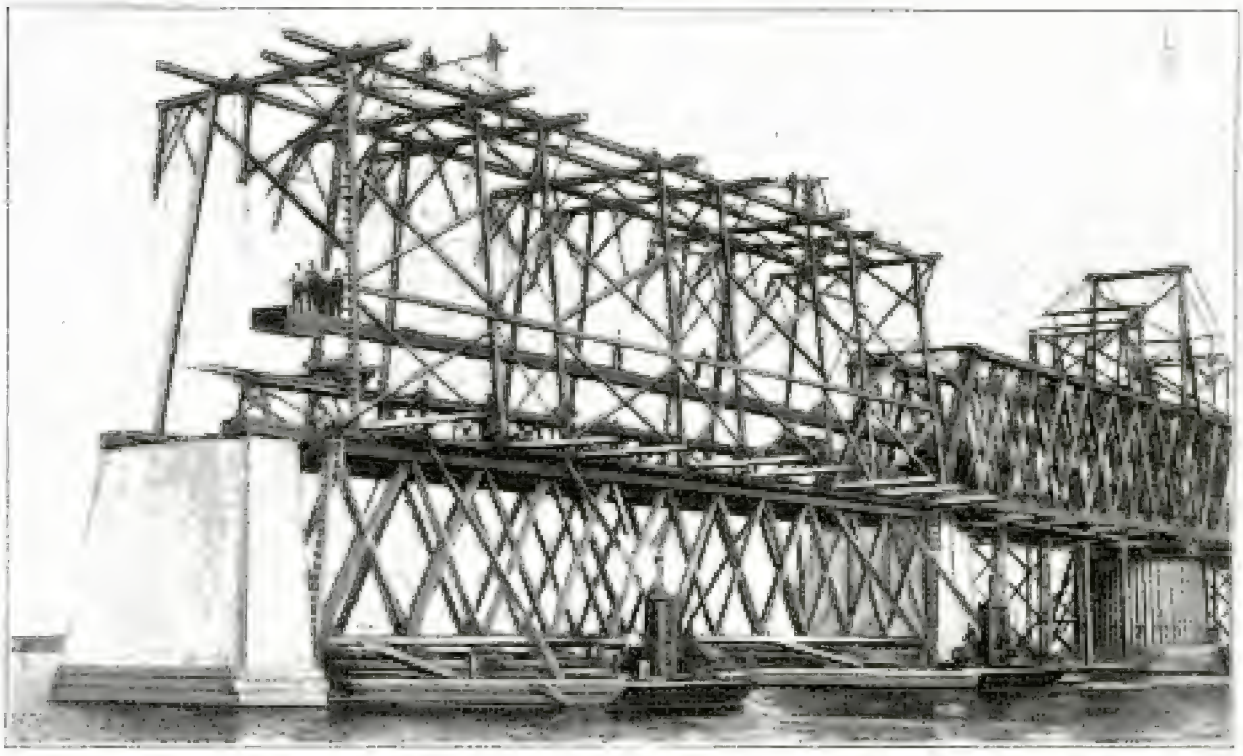
THE GAEKWAR OF BARODA'S VAST WEALTH

The Gaekwar of Baroda, who is one of India's most potent princes, ruling over a state 8,099 square miles in extent and having a population of 2,000,000, possesses vast wealth, having an income claimed to be more than $10,000,000. His jewels are among the most wonderful in the world, and include a necklace composed of 200 diamonds, valued at $10,000,000, and a carpet, 4 yd. wide, made of rubies, diamonds and pearls, woven into a pattern, said to be worth $4,000,000. Although the four cannon which defend his castle have steel cores, the outer parts of two of them are composed of gold, and the other two of silver.

BUILD MODERN TIMBER RAILROAD BRIDGE

To build a large heavy-traffic railroad bridge of timber in this day of structural steel may seem unusual, yet such a bridge, comprising nine 150-ft. Howe trusses, one 240-ft. swing draw span, and nearly 1,000 ft. of timber trestle in approaches, has just been constructed across the Columbia River by the Oregon-Washington Railroad Co. The piers are of concrete. The spans have an aggregate length of 1,639 ft., and the remaining distance between abutments is covered by timber-trestle approaches, the one upon the west side being 503 ft. long, and the east approach, 447 ft.

All timbers used in the construction were of Washington fir, and the life of the approaches and truss spans is estimated at 8 to 10 years. All joints and framed portions of the trusses were treated with a liberal coating of red mineral paint mixed with linseed oil, and the entire timber portions were given one thorough coat of this preservative. Much attention was



Erecting the Timber Spans of a 1,639-Ft. Railroad Bridge Constructed across the Columbia River. The Erecting Framework is Carried by a Pair of Timber-Deck Trusses Supported on Two Scows

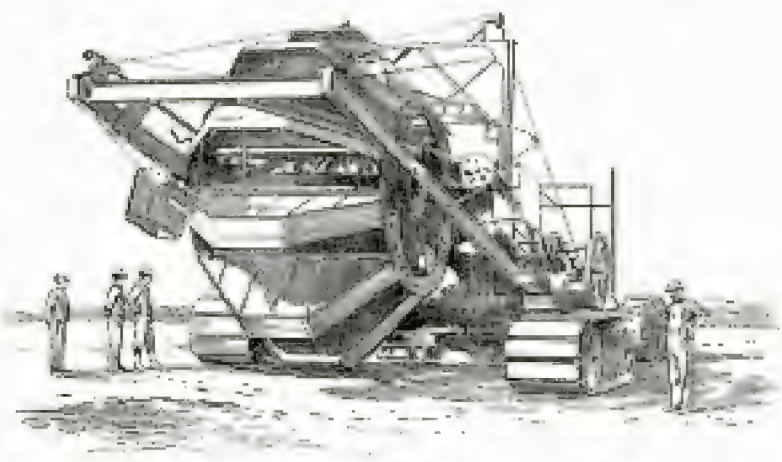
paid to the design of joints, and in every point of contact of timber on timber an iron plate or casting has been introduced to minimize rotting.

A MACHINE THAT DIGS A MILE OF DITCH PER DAY

What would an ancient Egyptian irrigation engineer say if he were to reappear on earth and be given the information that the modern builder of irrigation works uses a machine that is capable of daily excavating a mile of ditch 6 ft. deep and 12 ft. wide? Undoubtedly he would immediately elect his informer to full membership in the Ananias Club and call him by a short and ugly word into the bargain.

This machine is said to be the largest excavator of its kind ever built. It is employed in the construction of canals and laterals comprising an irrigation system to water the 16,000 acres which compose the Cudahy ranch, situated in the Imperial Valley of Mexico, just across the international boundary from California. The conditions are identical with those of the valley of the Nile, for this ranch is of silt lands built up by the ages of overflow of the Colorado River.

The huge machine weighs 100,000 lb. and covers an area of 25 by 60 ft. It is entirely of steel construction and is propelled by two 30-hp. gas engines. The fore part of the machine carries the engines which drive a shaft wheel, which, in turn, by a series of cogs and chains, propels the machine over the ground and at the same time operates



One of the Largest Ditch Excavators Ever Built

the immense circular digger carried at the rear. This digger is equipped with scoops bearing sharpened blades of steel. It first picks up the dirt and revolving upward, drops its burden onto conveyors which carry it to both sides, depositing it upon the banks of the excavation.

The machine, cumbersome as it appears, is so nicely adjusted that it can dig a ditch from 2 in. up to 8 ft. in depth and from 4 to 12 ft. wide, shaping and finishing the excavation as it proceeds. With this machine, seven men do the work of 50 scraper shovels hauled by 100 mules, with a driver for each team.

THE WHITE SPECTER

The odd contour of the rocks that form the mouth of a cave at La Jolla, California, forms a fanciful resemblance to a woman's figure, as the photograph indicates. She wears a headdress somewhat like the "liberty cap," holds her arms slightly akimbo, and the folds of her skirt at the hem are suggested by the waves that break upon the beach outside. In securing this picture, the artist explored the cave and carefully selected a point for his camera where all the lines of the rocky entrance would conform to this general idea of "the white specter."

The Opening of a Cave at La Jolla, Cal. The Photograph Here Reproduced was Made by a Photographer Located in the Cave

ELECTRIFICATION OF THE GOTTHARD LINE

Almost every American traveler who has visited Italy and Germany has also traveled through Switzerland over the Gotthard railway which unites Italy and Switzerland by rail.

The long tunnel through which the line passes has ever been a great nuisance to every traveler, on account of the penetrating smoke which could never be entirely shut out of the cars. It takes the express 20 minutes to pass through the largest tunnel, and there are about 12 shorter tunnels on this line. The smoke emanating from the two large locomotives is very offensive, and it has been adequately proven that the cars of this line deteriorate more rapidly than on any other part of the various railways. The sulphur, which is free in the smoke, destroys the best of paints and varnishes and attacks the wood of the cars.

Considering all these disadvantages, the Swiss Railway Federation, has, after much discussion, voted for the electrification of the Gotthard line. The work will be started in a short time, but it will probably be several years before it is entirely completed.

COMBINED PLAYER VIOLIN AND PIANO

The new combination mechanical-player violin and piano being placed on the market by a Leipzig, Germany, firm, is arousing much interest, not only because it combines the violin and piano, either of which can be played alone, but because of the wonderful quality of the violin tones.

In the violin part of this machine a circular bow is rotated around three violins by electric power, and the violins are shifted with increasing or decreasing pressure against this bow by

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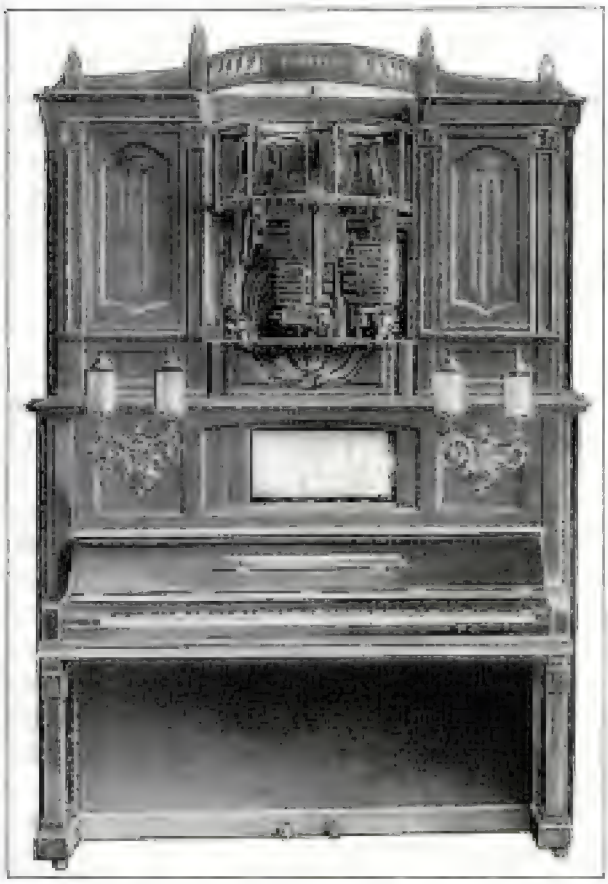
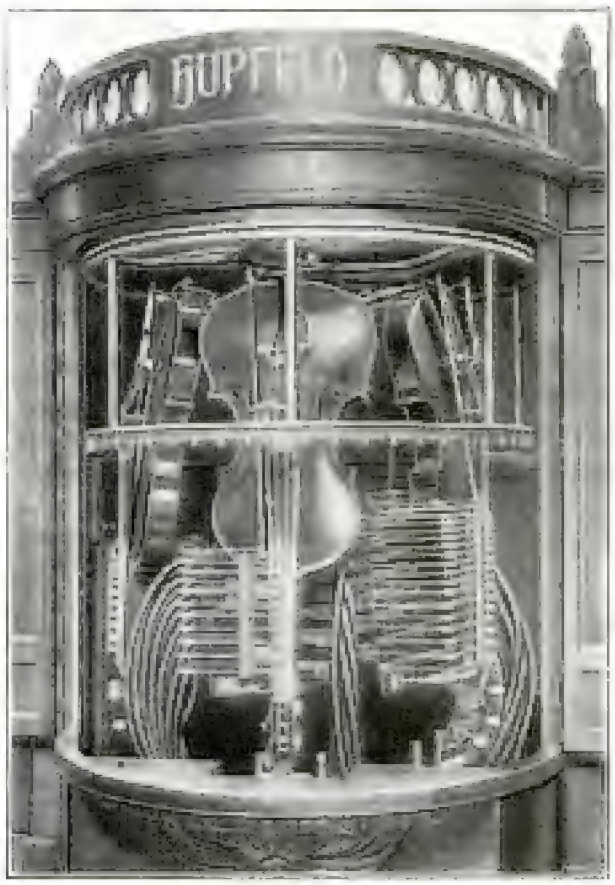


New German Mechanically Played Violin and Piano



A Close View of the Violin Mechanism

means of pneumatic force, and thus the gradual, soft sound is obtained as if by human hand. A series of levers, taking the place of the human fingers, press against the lower end of the various strings.

By shutting off the electric current, the piano, which is provided with the perforated records required for mechanical playing, may be played as an ordinary instrument. The perforated music roll for the violins is inserted in the upper part of the cabinet in a vertical position.

AN EXPLOSION CAUSED BY STATIC ELECTRICITY

An explosion that occurred recently at the works of the Cotton Powder Co., Ltd., near Faversham, Eng., which unfortunately resulted in the death of one of the workmen, has been accounted for after a thorough investigation, as being due to static electricity, according to the Electrical Review.

The man who was killed, was engaged in spreading a highly explosive mixture—consisting of fulminate of mercury, chlorate of potash and guncotton—upon a rubber cloth for the purpose of drying it. The weather, for a period previous to the explosion, had been exceedingly dry and warm, and, no doubt, the mixture was quite a bit drier than the workman supposed. In view of the fact that the man wore rubber shoes, which insulated him from the surface upon which he stood, there was supposed to be a sufficient accumulation of static electricity, due to the friction between his fingers and the rubber cloth, upon which he was placing the mixture, to produce a spark which ignited the mixture and caused it to explode.

During the investigation of the cause of this explosion a number of experiments were made, and it was found that under the above conditions sparks could be produced of sufficient size to ignite guncotton and fulminate

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mixtures. The trays in guncotton-drying stoves are often fitted with strips of copper to prevent the accumulation of static electricity. After an earlier explosion, of acetone vapor, at another factory, due to the discharge of static electricity from a workman's finger, the workmen were all protected by having copper rivets placed in the soles of their overshoes. The rivets permitted the static electricity to readily pass from their bodies, and the danger due to a spark being formed by the discharge of an accumulated quantity of electricity was thus eliminated.

A SUMMER HOUSE OF BOX

While box hedges are often trimmed into fantastic shapes, it is seldom that one finds such an attractive and useful specimen as that shown in this photograph. The circular hedge has been converted into a summer house with a door and windows and the tops of the trees meet in a cone-shaped roof. The interior is furnished with seats, making a delightful, shady retreat for a hot day.

A Cool and Attractive Summer House of Box Hedge

¶An electric cigar lighter, attached to the batteries by a flexible cord and kept in a polished metal casing attached to the dashboard, is suggested as a practical smoker's device for automobiles.

NEW COPPER ALLOY

A new copper alloy which has the hardness of steel and has great tensile strength has been invented by a French metallurgist. Eleven pounds of chromium are melted for one hour with 11 lb. of aluminum, and then 242 lb. of copper are added. The entire charge is kept at fusing temperature for half an hour. Then 55 lb. of nickel are added and the mixture is heated another hour, upon which 44 lb. of zinc are added.

The proportions of copper and chromium can be varied according to the use to which the alloy is to be put, according to La Fonderie Moderne, but the order in which the metals are brought to melting temperature, as also the addition of aluminum, must not be changed.

NEW METAL CALLED "CANADIUM"

"Canadium" is the name given a new metal discovered by A. G. French, metallurgical chemist of Nelson, British Columbia, when investigating a large gold mine in that province. While examining a deposit of platinum metals, he discovered, sometimes isolated and sometimes in combination, another metal which was quite different from other members of the group. It has since been found in many other igneous dikes in the vicinity of Nelson.

Canadium is a beautiful white metal, but little softer than gold or silver and melting at a somewhat lower temperature. It is not tarnished by damp atmosphere nor blackened or affected

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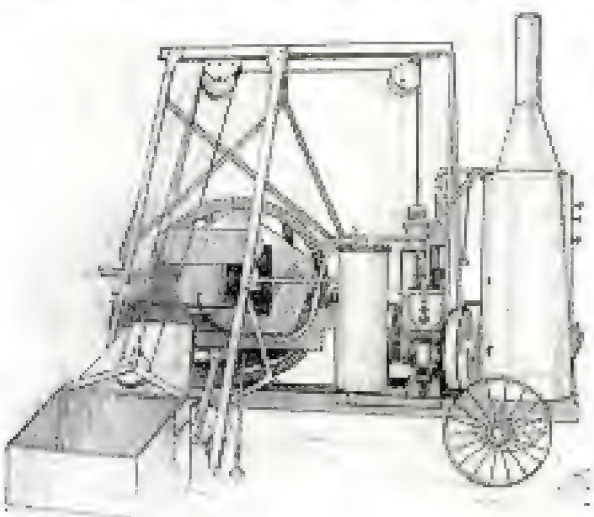
by sulphureted hydrogen, alkaline sulphides or tincture of iodine, which blacken both silver and palladium. When burnished, it is much more brilliant than either silver or palladium.

CUBE MIXER PROVIDED WITH HEATER

A new combination in mixing apparatus, consisting of a cube concrete or asphalt mixer having an ordinary charging elevator, boiler and engine, but provided with a material-heating attachment, is being placed on the market by a Chicago concern. Just beneath the charging hopper is a small steel box, lined with fire brick, forming a combustion chamber. Crude oil, contained in a tank carried on the platform of the machine, is carried by compressed air to an oil burner or atomizer, which projects directly into the combustion chamber. The heat thus generated in the combustion chamber is driven under air pressure into the mixing cube, where an intensely high temperature is generated.

It is claimed that in one test only three minutes were required to thoroughly heat a mixture of crushed rock and liquid asphalt, but the stone was thoroughly dry before being turned into the mixer. Very wet stone requires about 5 min. for complete heating, and is then too hot to be handled with the hands.



This Cube Mixer Provided with a Heating Attachment Is a New Combination in Mixing Apparatus

PLAYING CRICKET ON SHIPBOARD

Now that golf and cricket have been played at sea, it would not be surprising to hear of a baseball or football game played on one of the big passenger steamships. During a recent voyage to Australia, where the team was to play Australian champions, an English cricket organization kept in practice by playing on the deck of the "Orvieto." The photograph illustrates the manner in which the deck about the players was completely netted in to retain the balls and prevent the injury of other passengers.

English Cricket Players Keeping in Practice en Route to Australia

According to The London Mirror the International Aeronautical Federation is considering the proposal of establishing a board of inspection to examine and mark aeroplanes with a distinctive symbol as ships are marked by Lloyds, with a view of making flying safer.

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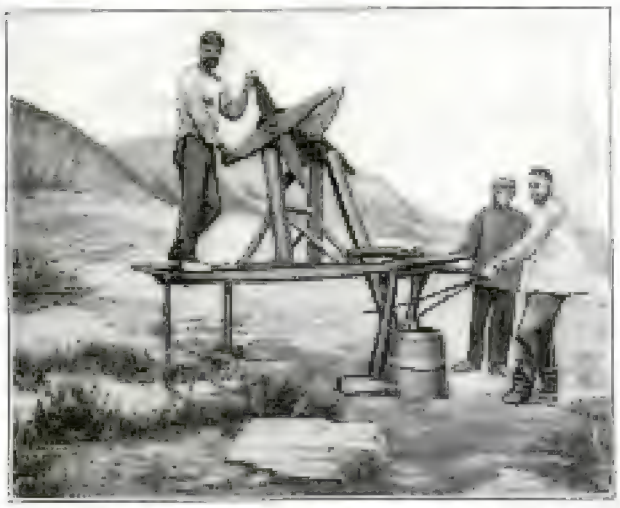
PRIMITIVE WORKING OF OIL WELLS IN RUSSIA

Although the Chatma oil field of Russia is very rich and oil is being extracted by modern machinery in the greater part of the district, the Russian peasant who first utilized the richness of the field is still using primitive apparatus. He has at present about 30 wells, each about 15 in. in diameter at the top and 8 in. at the bottom, and varying in depth from 40 to 60 ft. These wells, according to a writer in the Petroleum World, are simply holes in the ground, having no casing of any kind, and are worked by two men with the aid of a primitive windlass, hauling a baler. When the oil gathered at the bottom of one well becomes exhausted, the men carry the windlass to the next well, and so on, returning to each well when sufficient time has elapsed for oil to gather again at the bottom. With this primitive apparatus, and selling the oil only locally, the proprietor makes a net profit of about $7,000 a year.



A Primitive Method of Extracting Oil Still in Use in Russia

EXECUTION OF ARABS IN TRIPOLI AS OBJECT LESSON

Among the recent executions of Arabs at Tripoli is included the hanging of 14 who were found guilty of having resumed arms and killed Italian soldiers after having surrendered. Being hung by the neck instead of shot was decided upon as providing more of an object lesson to the natives. They were strung up side by side on a long gibbet in the bread market before the troops and a stolidly indifferent crowd.

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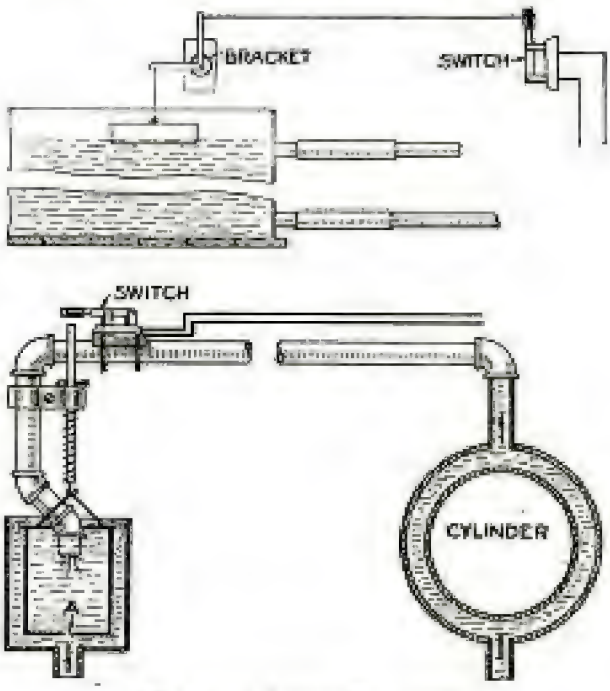
Safety Stop to Prevent Gasoline-Engine Cylinders Overheating

In the accompanying illustration are shown two ways of inserting a safety switch in the circuit of electric wires on the ignition system of a gasoline engine to prevent overheating, should the water for any reason fail to reach the cylinder.

On the thermo-siphon system of cooling, it is easily made, as it requires only an extra switch, a block of wood for a float, some wire and an L-shaped piece of metal. The first sketch shows how it makes a break in the circuit when the water falls below the required amount.

For engines using forced-feed circulation from a low water supply the safety switch can be installed as shown in the second sketch. This requires an extra switch, an old curtain-pole spring with the wooden rod in it, a sheet-metal clamp to hold the spring, and a small pail. A larger pail to receive the overflow from the small pail is connected to the return water pipe as shown. In the bottom of the small pail there is a hole, A, one-quarter the diameter of the outlet on the pipe. As long as there is plenty of water the small pail will overflow and hold the pail down, but when the water fails to run, the small hole will drain the pail, the spring will draw it up, and the small rod inside of the spring will make the break at the switch. A small nail driven in over the clamp will keep the pail from stopping the flow of water through the pipe below.

When adjusting the small pail upon installation, it should be filled with water and the hole in the bottom plugged until the right adjustment is reached. When starting the engine, pull the plunger rod in the spring to



Wiring and Switch Connections

one side of the switch. The flexibility of the clamp will allow this to be done. —Contributed by J. P. Simons, Herrick, So. Dak.

Homemade Chair Bottoms

Chair bottoms can be made at home by anyone who can drive a nail straight. The following method was used by a suburbanite who could not take advantage of city conveniences or afford the prices. This chair bottom can be easily duplicated by persons similarly situated. The cost is small and the labor so slight that 15 min-

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utes will be sufficient to complete the job.

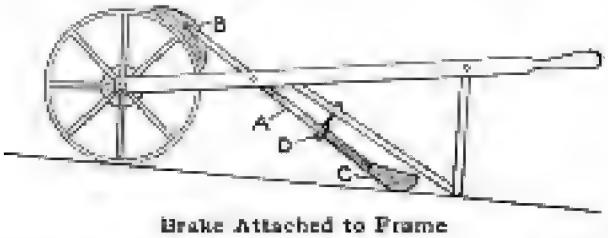
Scraps of the paper that was left from the roofing of his bungalow were utilized. These pieces were a very good grade of paper, which can be procured from a first-class dealer in lumber. The paper has the appearance of leather, is about the same thickness, and wears well. The paper can be bought by the roll or square foot, and a single square yard should be sufficient to make bottoms for several small chairs.

The paper is fastened with carpet tacks or brass-head upholstering tacks, the latter making a better appearance. Place the material under the bottom of the chair and mark with a pencil the size of the opening. Cut out the bottom with scissors or a sharp knife, 1 in. outside of the pencil line and tack it on the top of the chair frame. —Contributed by Della Yoe, Knoxville, Tenn.

A Wheelbarrow Brake

Pushing or rather holding a loaded wheelbarrow in going down an incline is very tiresome, and I made a brake as shown in the sketch that works exceedingly well. The brake consists of two pieces of channel iron, A, run between the handles of the wheelbarrow frame down to a trifle below the level of the supports on the handles. On the top of these channel irons I fastened a block of wood, B, by means of a single bolt. Another block, C, is placed at the bottom.

To prevent the brake from sliding on the ground when the handles were

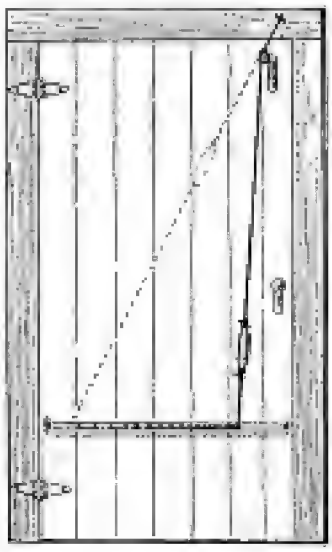


Brake Attached to Frame

lifted, an eyebolt, D, was placed in the brace to hold the channel-iron arm. When going down an incline with a load, it was only necessary to slightly lower the handles and the pressure on the block C would cause the brake block B to be held tightly against the wheel.—Contributed by J. N. Bagley, Superior, Neb.

Use for an Old Shade Roller

Many shed and storm doors are hung where it is almost impossible to attach a weight in the ordinary way without interfering with other doors or with people passing in or out. By using an old shade roller, as shown in the drawing, the weight can be put on the door itself, taking up no room, the roller keeping the weight in place.



Take an old shade roller and break off the stops or checks, leaving the roller, when the spring is wound up, to run its limit without stopping. Take the holders of the same roller and place them on the door about 1 ft. 6 in. from the bottom in a similar manner as when they were on the window. Then place the roller in the holders and drive a nail over the side with a slot in, to keep the roller from slipping out. Then take the end of the line (heavy twine will do) and tack it in the roller on the side nearest the hinges, and wind the line around the roller. In that way, when you pull the string, you wind up the spring, just as a curtain is wound around a roller, and when you release the string it winds up. After this is successfully tried, turn the spring around about ten times so that it is always strong, and tie the other end of the line to the weight.

The rest is simple. Put a small hook in the frame over the door; fasten the end of the string to this, pass the line

through the pulley, which is on the upper corner, down, and attach it to the other end of the weight.—Contributed by J. L. Brown, Jersey City, New Jersey.

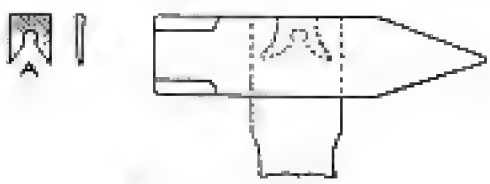
Care of Blowtorches

When extinguishing the flame of a gasoline blowtorch or fire pot, the valve should never be allowed to remain tightly closed. If it is closed tightly and left so, the hot valve body will contract as it cools on the needle, and this will cause the needle to slightly enlarge the hole through which the vapor issues, and the torch will fail to work so well.

To shut off the flame, the valve should either be nearly closed and the flame blown out, or else entirely closed and then slightly opened.—Contributed by Van Allen Lyman, Paynes Creek, Cal.

Wedge for a Hammer Handle

A common wedge in a hammer handle usually comes loose in time and causes considerable trouble to keep the hammer tightly on the handle. If the wedge can be kept in place, the hammer will not loosen on its handle. A simple wedge that will not come out is shown at A in the sketch. It is made



Shape of the Wedge

of soft steel. When driven into the hammer handle, the wood spreads the two prongs so that it is impossible to pull the wedge out.—Contributed by F. G. Marbach, Cleveland, O.

How to Stiffen the Backs of Saws

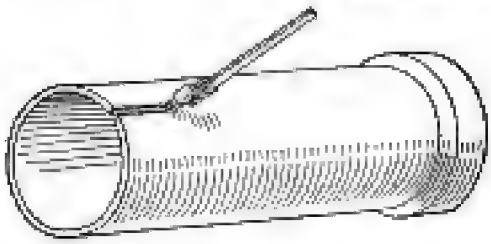
When cutting hard wood with a carpenter's saw I have had much trouble with the sudden bending of the saw, which would cause it to break or get out of line. Where there is no heavy work to be cut requiring the saw to pass entirely through it, the device described as follows will be found helpful.

Metal on Saw Back

Secure a piece of stiff sheet metal, about 18 in. long and 1½ in. wide. Bend it to a narrow U-shape so it will fit over the back of the saw, as shown in the sketch. This will prevent the saw from bending, and the metal may be easily removed when desired.—Contributed by Wm. Grotzinger, Baltimore, Md.

Cutting Terra-Cotta Tile with a Pipe Wrench

An ordinary large pipe wrench makes a much better tool for cutting terra-cotta sewer tile than a chisel and



Wrench in a Cut

hammer. The wrench is less apt to break the tile where it is not wanted.

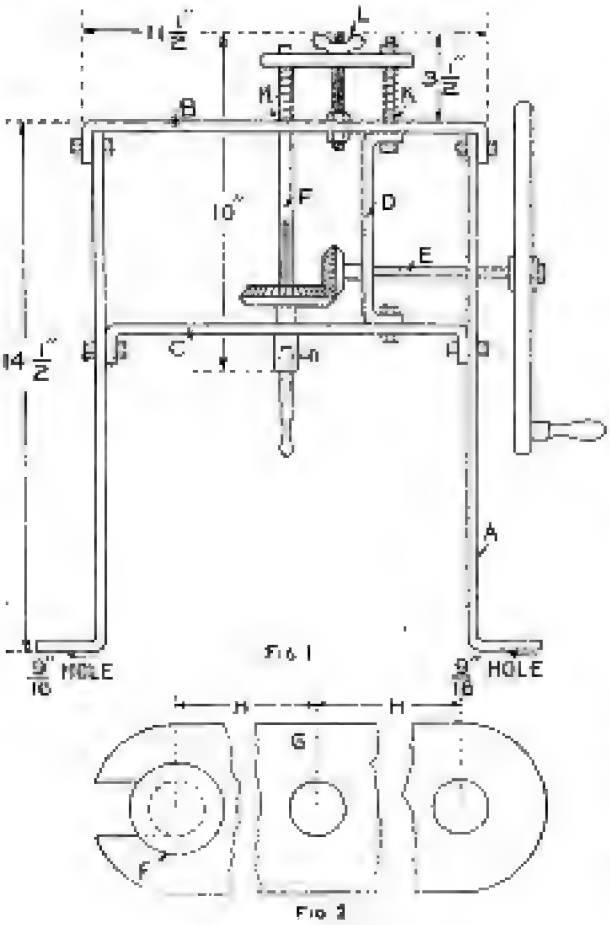
The manner of using the wrench is very similar to that of breaking glass away from a cut with a pair of pliers. The jaws are set to the thickness of the tile wall and short bits are broken away by leverage as the course of the cut is followed.—Contributed by L. H. Atwell, Atlanta, Ga.

¶ Two mill files placed crosswise in a vise so as to form a V, make a good knife sharpener. The knife edge is drawn through the V-notch.

¶ Cement work, consisting of 1 part cement and 3 parts sand, can be made waterproof after the work has set by applying as much kerosene oil to the surfaces as they will absorb.

Homemade Drill Press

The elevation of the drill is shown in Fig. 1. The two uprights, A, are of 1½ by ⅜-in. iron, as are also the horizontals B and C, and the intermediate upright D. The main shaft, F, is of ⅝-in. round steel, as also handwheel shaft E. Cut a $\frac{3}{16}$-in. keyway in the shaft F. Obtain a pair of bevel gear wheels. Fix the small wheel on the shaft tightly with a pin, but allow wheel on the vertical shaft to slide with a flat key. The feed is controlled by the wing nut L. Two coil springs, K K, keep the pressure plate against the thumbnut.



Details of the Drill Press

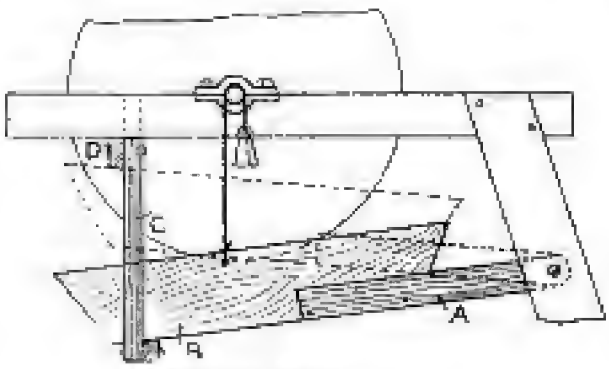
The dimensions H H, Fig. 2, must be determined by the size of the wheels procured. The top of the shaft F must be turned to form a notch to slip into a slot cut in the plate G, which is 1¼ by ⅜ in. All bolts and studs are ⅜ in.—Contributed by J. W. Verner, Roxbury, Mass.

Removing Fence Posts

A laborer was sent to remove a number of fence posts from an old fence. The job would have taken a half day of ordinary work, but two hours later we found him asleep in the shade, and the posts all removed. We let him sleep till noon as we thought he had earned his rest. His method of removing the posts was very simple, as he used an ordinary gravel pick, drove the sharp point into the post close to the ground, put a hardwood block under the pick and pulled on the handle. This operation was repeated as the post was drawn out of the ground.—Contributed by J. C. Auman, Saskatoon, Can.

Wetting Attachment for a Grindstone

A grindstone will quickly absorb any water in which it rests, thereby causing it to become worn unevenly and run out of true. The sketch shows how to attach a trough which is raised when the crank is turned, thus bringing the water in contact with the face of the stone as long as the grinding goes on. Two braces, A, are bolted loosely to the legs of the stand and fastened on the sides of the trough B, which normally rests on the support C. A small rope is fastened to the trough and wound around the shaft to give it the necessary friction. A small weight is added to raise the trough to



Swinging Water Trough

the stop D. When through grinding, raise the weight, and the trough will lower itself.—Contributed by John V. Loeffler, Evansville, Ind.

The Art of Stencil Making

By HOMER H. KNODLE

PART IV—Centerpiece and Panel Designs

A design that will fill the need of a dark effect where it is necessary to balance the scheme of treatment is shown in Fig. 30. It may be used for a panel by surrounding it with a border, either fancy or straight-line. If a line is used, it should be heavy enough to harmonize with the main part of the design. The torch should have the binders across to relieve the monotony of the heavy outline. It should not be made much larger than 2 ft., nor smaller than 1 ft., as the massiveness of the design necessitates large treatment. This design is susceptible of a variety of changes without altering the general outline. A slight change may be made by leaving narrow binders throughout the length of each bar crossing the darts.

A heavy effect, for a centerpiece, is shown in Fig. 31. The central oval may be attached to the balance of the design, if so desired, or it can be kept separate. In the former case, the oval should have a lighter treatment. The scrolls can be ornamented in any manner in harmony with the general style of the design, and the outer border may be varied in several ways. A large portion of the design should be left white so as to relieve the heavy outlines and give the desired contrast. This design can be made in almost any size, and only one-half need be cut out as the stencil can be reversed to finish the other half. It should not be made smaller than 30 in.

Another panel design that can be treated in various ways is shown in Fig. 32. It may be used as shown, or inclosed in a border of proper proportions, or it may serve for a combination border and panel by using the top portion as a border, inclosing it in a neat border, and the bottom part as a panel design, inclosing it also, but stenciling the bottom design only under every other motif of the top. This will give about the proper proportion and will be found to look very well. It will prove doubly effective if it is stenciled in a lighter tint of the body color, and trimmed with a contrasting color. This design also may be variously altered to produce original patterns.

A heavy centerpiece design that will be found especially adapted to use in conjunction with other designs in the decoration of Gothic buildings, is shown in Fig. 33. The leaves of the design are laid out on radial lines drawn with the aid of the 30 and 60-deg. triangles, used separately and together. The outside border may be given a variety of treatments and permits some delicate work.

The various panel designs can be changed by using different borders,

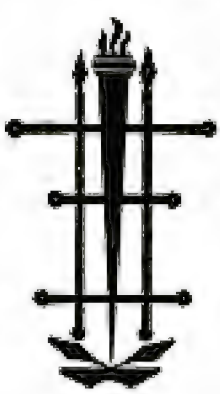


Fig. 30

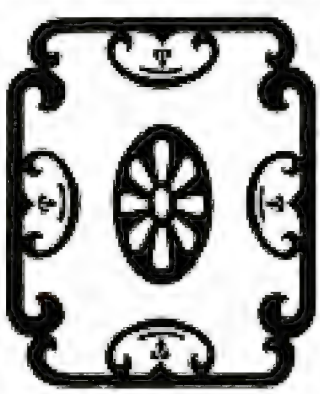


Fig. 31

Fig. 32

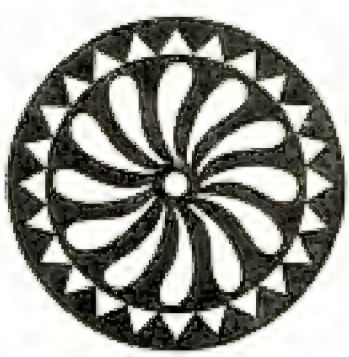


Fig. 33

Centerpiece and Panel Designs

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which, however, must harmonize with the design to produce the proper effect. Four such designs are shown in Figs. 34, 35, 36 and 37. That shown in Fig. 34 should be made from 1 to 2 in. high, or may be made as high as 4 in. and be used alone as a border. The one shown in Fig. 35 is very similar, but is not adapted to be used alone. It must not be cut larger than 2 in. Figure 36 shows a purely geometrical design which will stencil in conjunction with other designs along the same line. It should not be made much larger than 3 in. It is designed by crossing a perfect square with another perfect square at an angle of 45 deg. and using the perimeter thus formed for the outline. The design in Fig. 37 is useful only for its contrast. The diamonds are shaped with the 30 by 60-deg. triangle, and the squares drawn in to suit the designer. Diamond shapes may be substituted for the squares.

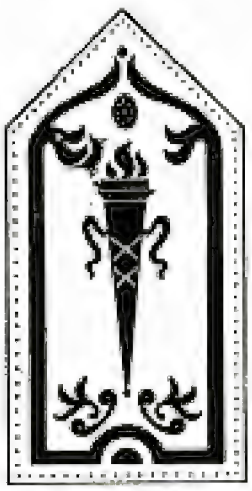

Fig. 38

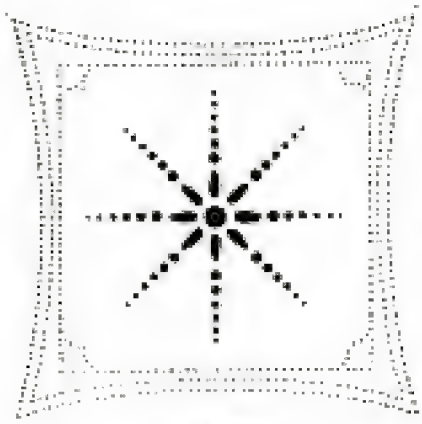

Fig. 39

Panel and Centerpiece

Another torch design adapted to a panel is shown in Fig. 38. A smaller design of a torch can be used with equally good results, and the design will look well also without the outside border.

A centerpiece, intended for light treatment or in small sizes in medium-heavy treatment, is shown in Fig. 39. This design can be made in any size needed, and is one of the most flexible motifs known. The center can be completely changed and the symmetry of the design still be maintained. The design is laid out mechanically and necessitates no free-hand work.

Throughout the work great care should be taken to preserve sufficient binders. The design should first be drawn full size, completely ignoring the binders, and first when this work is completed, the binders should be laid in and colored as previously described, starting at the center of the design and working outward. If a design contains 12 repetitions and one or more binders each, one of the binders in each design connecting like pieces are cut one after the other. This will prevent the maker cutting or forgetting a binder. The binders need not be any wider than ¼ in. Only one principle need be observed: to place the binders where they will be as short as possible.

Fig. 34

Fig. 35

Fig. 36

Fig. 37

Borders for Panels

¶Oiling nails with common machine oil makes it easy to drive them into hard wood.

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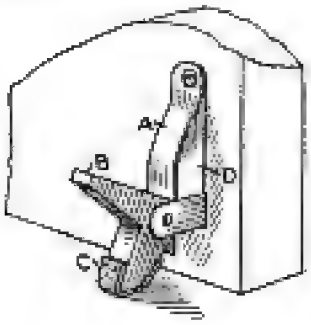
Ash for Cleaning Cooking Utensils

A good ash for this purpose can be made by burning rags coated with the following solution: Dissolve 2 lb. of coarse salt in 1 gal. of water and soak the rags in this solution. After drying the rags they are burned in the open air and the ash saved. To use, moisten a rag in water and sprinkle a little ash over it and scrub the utensil.

This ash with a little vinegar added also removes flyspecks from gas-lamp globes and all glass articles. It does not injure either the hands or the articles to be cleaned—Contributed by Loren Ward, Des Moines, Iowa.

A Door Holder

A door that is closed with a spring can be held open at any point with a stop as shown in the illustration. The stop can be thrown in or out of action with the foot.



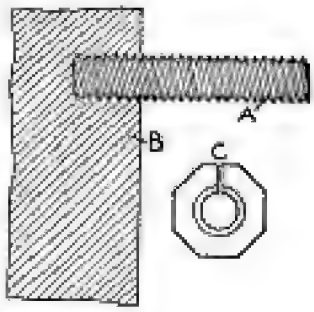
The base D is a piece of sheet metal cut and bent to form a bearing for the L-shaped block of wood B. The spring A holds the block either up or down as it is set. A piece of rubber, C, is put on the wood for contact with the floor.—Contributed by C. R. Poole, Los Angeles, Cal.

A Draftsman's Substitute Horn Center

Take an ordinary solid-head thumb tack and make a small depression exactly in the center of the head with a center punch. File the tack part until it is about 1-32 in. in diameter. This will prove valuable to the draftsman where a lot of circles are to be drawn from one center. It will not dull the compass points.—Contributed by Theo A. Oberhellman, St. Louis, Mo.

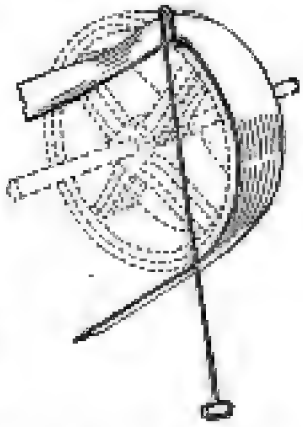
Removing a Threaded Stud

A threaded stud screwed solidly into metal is hard to remove without injuring the threads. Such a stud was in a flywheel of an automobile engine and I wanted to remove it without twisting the metal off or mashing the threads. The threaded stud A was very solid in the metal B. I used a split nut, C, clamped like the jaws of a vise over the threads, in turning the pin. The stud was thus easily removed and without injury to the threads.—Herbert A. Bartlett, Brockton, Mass.



A Belt Stick

The illustration shows a very handy device for placing belts on pulleys. The device is made of ½-in. iron in any suitable length. If it is to be used for very heavy belts, make it of ¾-in. iron, and the length will depend on the height of the pulley from the floor. Belts can be easily put on pulleys from 16 to 18 ft. from the floor.—Contributed by Lewis F. Enyeart, Marion, Ind.



Coloring Iron or Steel Silver-White

Dissolve about 1 qt. of white-ash bark ashes in the cooling water, which must be soft. Heat the iron or steel to a good red and then plunge it into the solution to cool. The metal will be silver-white when removed.—Contributed by Irl R. Hicks, Hallsville, Mo.

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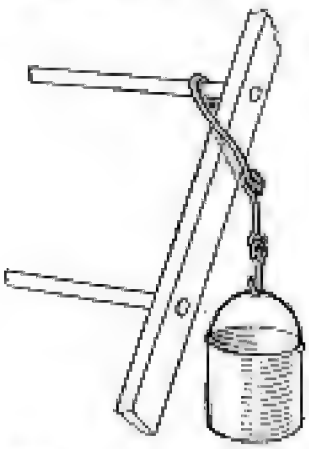
Paint-Pot Hanger

The ordinary method of hanging a paint pot on the rung of a ladder makes it necessary to pass the brush between the rungs to reach the paint. A very handy way to hang a pot is to use a hook made up in sections, as shown in the sketch, and hang the pot over the side of the ladder. This will prevent dropping of paint on the rungs of the ladder, and also makes it accessible for the painter.—Contributed by Fred L. King, Islip, N. Y.

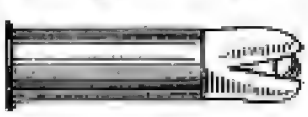


Emergency Belt for a Motorcycle

A little distance from home I broke the V-belt which drives my motorcycle. A new belt could not be secured and the old one was beyond repair. I tried a number of ideas, but to no avail. Finally I decided to take the clinch from an old automobile tire and use it as a belt. This belt carried me about 500 miles, and when I removed it to put on a new belt, it was in fine condition.—Contributed by J. N. Bagley, Superior, Neb.

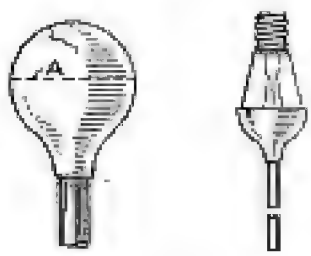
Increasing the Killing Power of a Small Rifle

A 22-caliber cartridge may be made to equal that of a larger-bore rifle in killing power by the following method. A long cartridge should be used. Split the lead from the point of the bullet almost to the edge of the shell. Flare the split slightly and place a small shot in the split as shown in the sketch. Use a shot about B-size. Close the lead over the shot with a pair of pliers so that it is held tightly. The shot should project a little beyond the point of the bullet. In striking an object the shot is driven into the bullet by the impact, thus spreading the lead still more and increasing the killing power. Trim off the bullet after cutting it open and fastening the shot, so that it will fit the bore of the gun.—Contributed by John L. Waite, Cambridge, Mass.



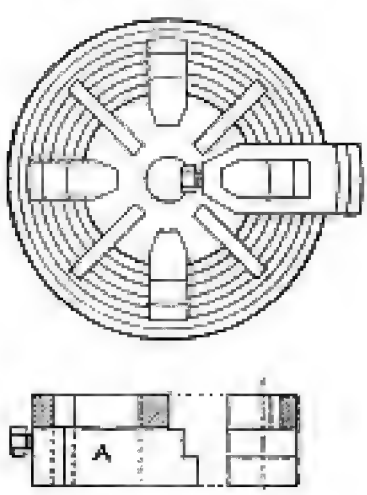
Long-Handle Electric-Globe Remover

A discarded automobile-horn bulb makes an efficient receptacle for replacing or removing electric-light globes in places too high to reach. The bulb is cut off on the line marked A in the sketch and the lower end is fastened to a long pole. The rubber will have sufficient hold to the glass bulb to allow it to be unscrewed from the socket. The use of the device is obvious.—Contributed by Morgan Hand, Jr., Ocean City, N. J.



Increasing the Size of a Lathe Chuck

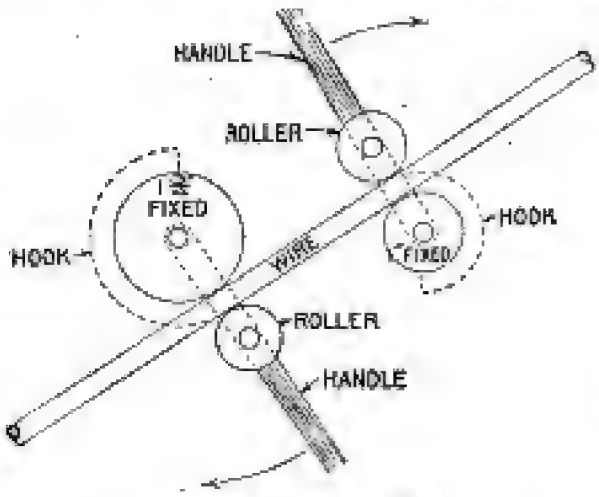
The attachment shown in the sketch is in use in a shop for the purpose of increasing the radius of an ordinary lathe chuck of small dimensions. The auxiliary jaws A slip over the regular jaws and are held in place by set-screws. The one shown is intended for holding piston rings or other hollow work that may be held from the inside. It is evident, however, that a modification of the same arrangement, having an over-



hang, may be applied, by which larger diameters may be chucked than would be possible with the regular chuck.

Making Hooks for Trolley Ropes

In making hooks for use in holding trolley ropes, instead of heating the wire and bending it over the horn of an anvil, a handy device used by a correspondent of Electric Traction Weekly makes the work easy and saves much time. This is shown in the sketch. It consists of two slightly grooved disks, respectively 1¾ in. and 1 in. in diameter, fixed to the base. Around the pins by which the disks are

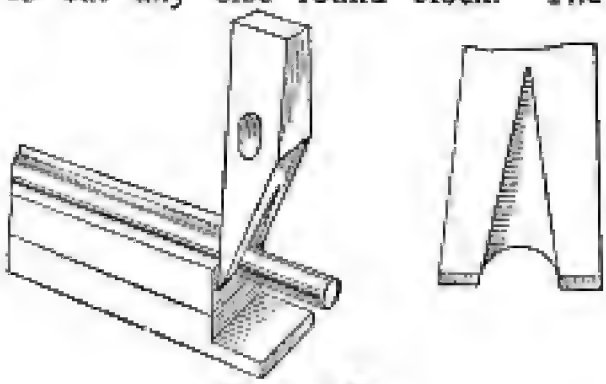


Levers to Bend the Wire

fastened to the base rotate two handles, to each of which, in the same plane as the disks, is attached a roller. The wire used, which is $\frac{5}{16}$-in. mild steel, cut to the proper length, is run between the fixed disks and the rollers, and by working the handles in the directions indicated in the illustration, the wire is bent into the desired shape.

Cutting the Ends of Round Stock

The base of the cutting tool is forged the same as a swage and capped with steel. An offset is formed to provide a cutting edge and a soft base for the chisel edge to strike when it cuts through the metal. The semicircle in the chisel edge should have a long slope filed so that it will extend upward on the sloping side of the chisel. The steel cap is rounded out to fit the round stock. A tool of this kind can be made to cut any size round stock. The



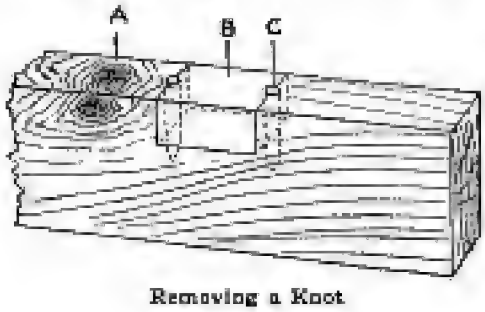
Cutter and Die

larger sizes should be cut hot. Both tools should be tempered, in the same manner as chisels.—Contributed by D. O. Wilkins, Hempstead, Tex.

Filling in the Place of a Knot

Sometimes, in using second-grade lumber for sluices, troughs and laundry tubs, a board will be sound except for a large loose knot that may happen to be on the edge. To cut the board at that point would be a waste of lumber, and to leave the knot in would present a bad appearance. The knot may be successfully removed as shown in the sketch. At A is shown a knot, and at B how the board will appear after the knot is cut out and a block put in its place.

The first thing to do is to mark around the knot, squaring a portion a little larger than the knot, then sawing on both end lines and carefully cutting the bottom out with a chisel. The chiseling can be better accom-



Removing a Knot

plished if several saw cuts are made through the knot. Fit a straight-grained block of the same material

tightly in the opening so that it will need driving in place. Bore a hole, deeper than the notch cut, at each end of the block and drive a pin, C, into each hole. Dress the surfaces with a plane. A knot in the center of a board can be fixed in the same manner with the exception that no pins are used.—Contributed by W. A. Lane, El Paso, Texas.

Method of Laying Out Angles in Degrees and Minutes

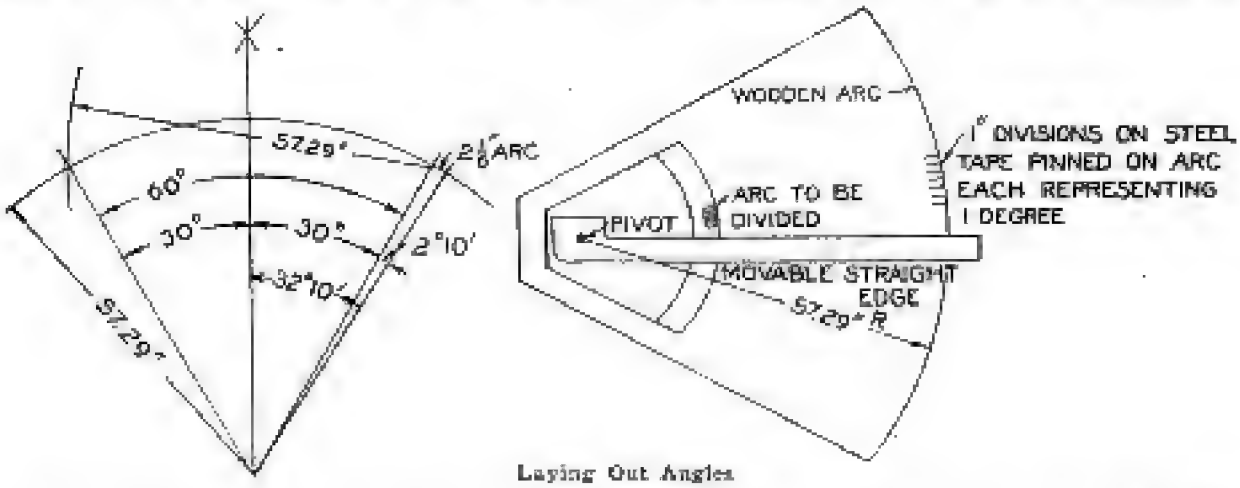
The following method for obtaining odd angles will be found very useful by patternmakers, machinists and those engaged in laying out bends for pipe lines, which are usually given in degrees and minutes.

Any angle can be obtained by the use of a trammel and pair of dividers, without any calculation, as follows: If an arc be drawn having a radius of 57.29 in., then 1 in. of the arc will subtend an angle of 1 deg., or in other words, if two points 1 in. apart be located on the circumference and a line be drawn from each point to the center, the angle between these lines will be 1 deg. It should be noted here that while this distance, to be absolutely correct, should be measured on the arc, for practical purposes the chord and arc for a distance of 1 in. may be considered equal. From the above it will be seen that an angle of 30 min. would have an arc ½ in. long; 15 min., ¼ in. long; 7½ min., ⅛ in. long, and 5 min., 1/12 in. long. It will be seen also that 1/60 in. on the circumference represents 1 min., and where a scale is not available having divisions in multiples of 60, a scale with 64ths can be used, if the number of minutes is small. When taking 1/64 in. to represent 1 min., it will be seen that the error is 1 min. in 15. If, however, the arc be drawn with a radius of 53.71 in., 1 min. on the circumference will be subtended by 1/64 in., or in other words, every 1/64 in. of the circumference will represent an angle of exactly 1 min., and 1 in. will represent 1 deg. 4 min.

It may be of interest to know how the radius 57.29 in. is obtained, which is as follows: If we assume that 1 in. on the circumference is to represent 1 deg., then the whole circumference which contains 360 deg. will be 360 in. long. If we divide this by 3.1416; we obtain 114.58 in., which is the diameter of the circle, and one-half of this is 57.29 in., or the radius.

It is evident that the method outlined is not intended for laying out directly a very wide angle, but rather for finding the odd degrees and minutes after the approximate number of degrees has been found in some other way.

For example, suppose it is desired to lay out an angle of 32 deg. 10 min. First scribe the arc with a radius of 57.29 in., then with the same radius lay off a chord on the arc which will give 60 deg. Bisect this arc and each half will be 30 deg. From one end of the 30-deg. arc lay off a distance of



Laying Out Angles

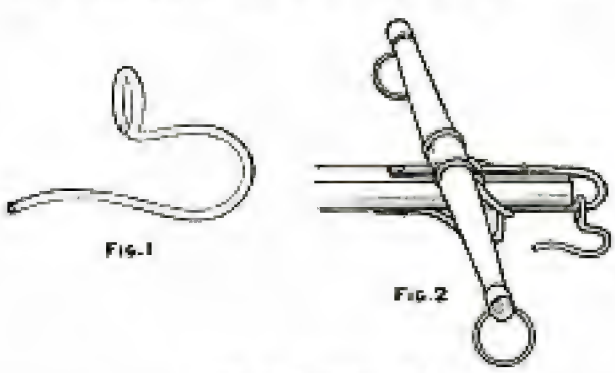
2 1/6 in., which added to 30 deg. will make the desired angle. This operation is shown in the first sketch.

If the angle is not required to be laid out very accurately, a radius of 28.64 in. can be used for the arc, then ½ in. of the circumference will represent 1 deg.; or with a radius of 14.32 in., 1 deg. will be subtended by ¼ in. on the circumference.

This method may be used for graduating arcs in degrees and fractions by sawing out an arc of the desired radius and pinning a steel tape on it as a scale. The arc to be graduated is fastened so that its center coincides with the center of the large arc. By means of a straightedge, pivoted at the center of the arcs, a very accurate division can be made. If a radius of 57.29 in. be used for the large arc, then with an ordinary steel tape the 1-in. divisions will represent degrees; the ½-in., 30 min., and the ¼-in. divisions, 15 min. The method of doing this is shown in the second sketch.—Contributed by C. A. Jackson, New York.

A Neckyoke Safety Hook

The purpose of the hook is to prevent the neckyoke from accidentally slipping off the tongue. It is made of a piece of round iron bar, about 12 in. long and bent into the shape shown in Fig. 1. The hook is fastened into the end of the iron on the tongue, as shown in Fig. 2. If, from any cause, the neckyoke should slip toward the

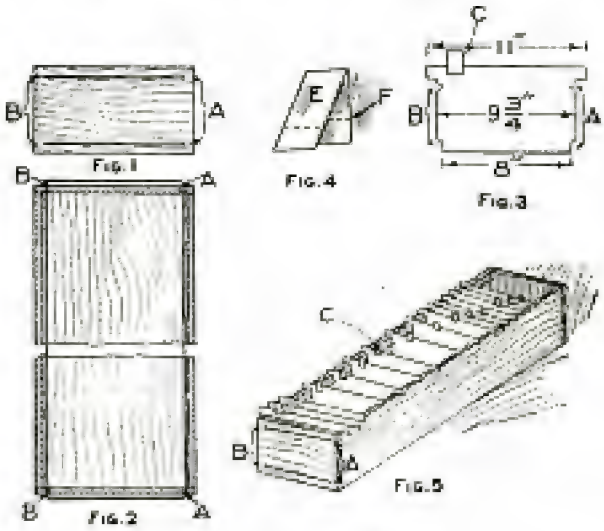


Hook on Tongue End

end of the tongue, the ring will catch in the hook and prevent the tongue from dropping down

To Make a Check and Bill File

Take two cypress boards, 4 ft. long and 6 in. wide, one board, 4 ft. long and 10 in. wide, and two pieces, 11 by



Check and Bill File

6 in., all ½ in. thick. Out of these make an oblong box, and at each end bore four holes, about ¾ in. from the bottom and sides, as indicated at A and B in Fig. 1. Run picture wire through from one end to the other, A A, Fig. 2, then across the end and back from one end to the other, B B, and fasten the ends at the starting point. Cut 26 pieces of pasteboard, as in Fig. 3, with notches as shown at A and B. Cut some heavy paper into 3-in strips about ½ in. wide and fold as in Fig. 4. Paste at dotted line F to board, and letter cards. Then insert cards in box in alphabetical order. The notches and wire will keep the boards upright and thus prevent loss and mixing of checks and papers. —Contributed by Maurice Baudier, New Orleans, La.

Removing Old Paint or Varnish

The average person, when wanting to revarnish or paint some article, removes the old coating with sandpaper. This is a waste of time and labor, as old paint or varnish can be washed off much easier in the following manner:

Dissolve one-half cupful of washing

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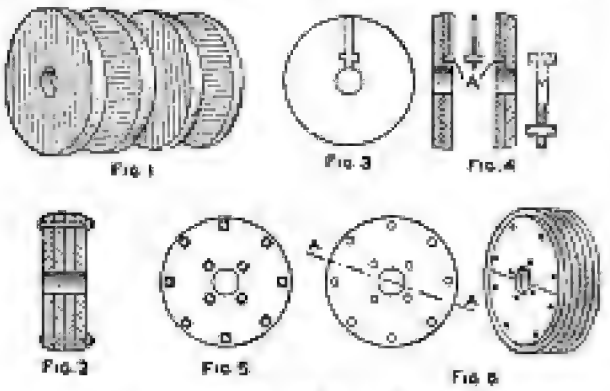
soda in a pint of warm water. Wet the article with this solution, then scrub it with a stiff brush. Rinse with clear water and let it dry thoroughly before recoating. This method will easily remove varnish or paint from crevices.—Contributed by Katharine D. Morse, Syracuse, N. Y.

Wood Pulley with Internal Setscrew

The drawings show how I built a wood pulley which gave good satisfaction and cost but a trifle for materials.



Parts of the Wood Pulley

Cottonwood was selected because with it there is less danger of cracking. Four circular pieces were cut and placed together, with the grain of each piece at right angles to its neighbor so as to prevent warping. See Fig. 1.

Placing these in a vise I fastened them with two carriage bolts, and then bored the hole for the shaft (Fig. 2). The shaft hole was bored so as to secure a snug fit. A ⅜-in. hole for the setscrew was then bored between the two central sections until it met the shaft hole (Fig. 3). Withdrawing the bolts, I cut a square pocket, A, Fig. 4, across the setscrew channel in each of the central sections. The pockets were cut a short distance from the edge of the shaft opening. Cutting the head off a ⅜-in. bolt I filed a screwdriver slot in it. This bolt when finished should be a trifle shorter than the channel so that it will not project beyond the face of the pulley.

The square pockets mentioned above should be cut just large enough to allow the square nut to fit in them without any play.

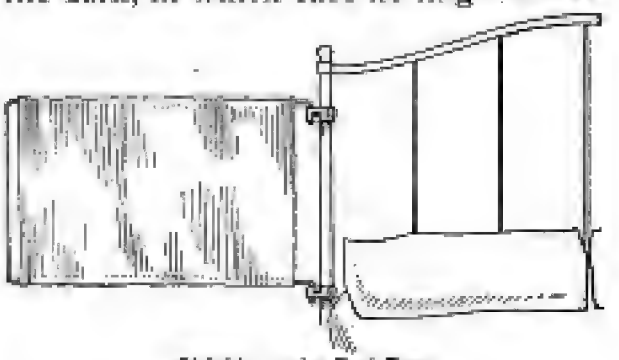
After placing the nut and bolt in the channel and pockets, I smeared the sections with white lead, inserted the two carriage bolts and added the remaining bolts as shown in Fig. 5.

As it was not advisable to screw the nuts and washers so tightly as to force them into the wood, I cut another piece of wood a trifle less in diameter than the other sections, Fig. 6, and bored holes in it to correspond with the bolts in the pulley. This piece was screwed to the pulley face to conceal the nuts and prevent them from tearing the belt, should it slip off on that side. This shield could be cut in half on the line AA, so that it could be removed without disturbing the pulley.

After filing a seat in the shaft for the setscrew, I placed the pulley in position and tightened the setscrew. I found that it held quite as well, if not better than a wedged pulley. If one setscrew is not deemed sufficient, more can be added in the same way.—Contributed by James M. Kane, Doylestown, Pa.

Draft Shield for a Bed

A screen for preventing drafts blowing across a sleeper's head, when a window is left open for fresh air, is shown in the sketch. The screen is attached to the bed post on hinges, so that it may swing in any position. This permits it to swing out of the way either when getting into bed or in case the sleeper gets up suddenly in the dark, in which case he might break



Shield on the Bed Post

an ordinary stationary screen or injure himself, if it were permanently attached.—Contributed by W. E. Morey, Chicago.

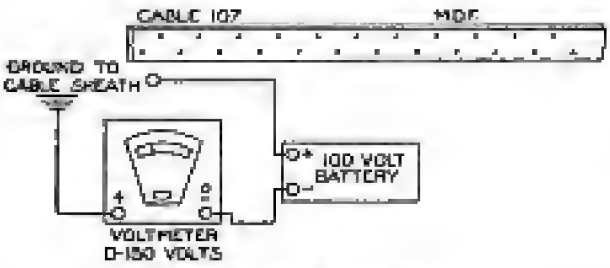
Tracing Down Telephone Troubles

By GEORGE M. PETERSON

PART II — TESTING

When a case of cable failure is reported, the galvanometer man is immediately called and he at once connects his voltmeter and battery on the cable and pairs which are in trouble, the connection being made as shown in the sketch, and care being taken to connect like poles together.

The first operation consists of connecting the voltmeter lead to a good ground, usually the cable armor, and touching each wire in the cable with the battery lead. This is the test for "grounds" and will show up grounded wires having anywhere from 2 volts to a "solid," or full voltage of the battery ground. A grounded wire with less than a 6-volt ground is fit to use, but is apt to be a bit noisy. If the voltmeter shows up several

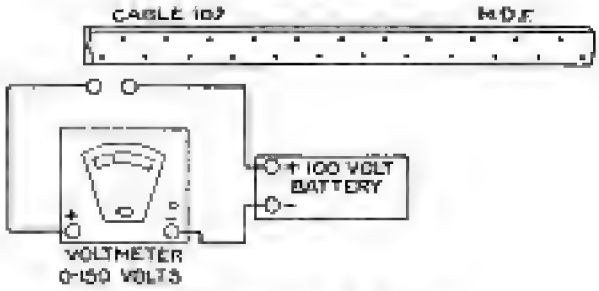


Voltmeter Test for Grounds

heavily grounded pairs, the trouble may be taken for a "ground" and a Wheatstone bridge or any of the various faultfinders is brought into action to obtain the exact location.

If the trouble happens to be "shorts" instead of grounds, the voltmeter is connected as shown and the leads touched to each side of a pair, taking the pairs straight through the cable and recording the voltage of each pair. If the full voltage of the battery is recorded, it shows a "dead" or "solid" short, and again the bridge is used to determine the actual location.

Crosses are also located with the voltmeter and battery by attaching one lead to the crossed wire until the wire with which it is crossed is picked up by the other voltmeter lead. If the battery has an E. M. F. of 100 volts and the crossed pair should register up to 140 volts, it shows that

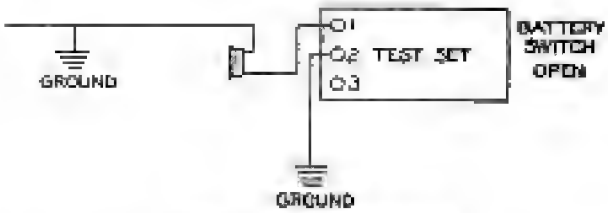


Voltmeter Test for Shorts

it is crossed with "battery," as the "common battery" system carries a voltage of 40. Often the voltage of a cross will be so high that the voltmeter needle leaves the dial completely. Then look out, as the cross may be with a high-potential circuit and great care must be exercised, not only to protect the instrument, but life as well.

The buzzer test set can also be used for testing out open crosses, shorts, etc. When testing for "grounds" with the outfit described in Part I, the circuit is arranged as shown for grounds. A heavy ground closes the relay through the receiver, but a light ground causes a faint click in the receiver alone.

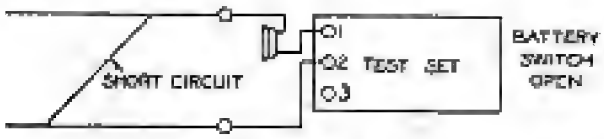
By putting a "ground" on certain wires at the farthest terminal box, one after another, and connecting test set as shown, the wires may be tested



Buzzer Test for Grounds

for continuity or "opens." A sharp click of the relay shows the wire to be continuous or closed, but the lack of any click in the receiver shows the wire to be open.

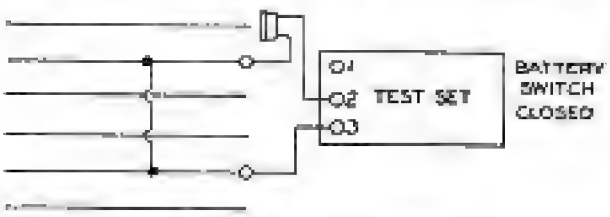
A "short-circuited" pair can be tested by arranging the set as shown for "shorts." The short circuit will cause the relay to close through the



Buzzer Test for Shorts

receiver. If the relay remains open, the pair is all right unless it is open.

In testing for crossed pairs in a working cable, the set must be con-



Buzzer Test for Crosses

nected as shown for "crosses," and test must be made from terminal. The cross will also make itself known by closing the relay through the receiver.

In an underground case, where tests show several heavy shorts and grounds, together with numerous crosses and opens, an experienced man would know that most likely the cause of the trouble was the cutting, or the breaking in two, of the cable. A solid ground on several pairs usually indicates that water has entered the cable through some poorly wiped sleeve, that electrolysis has eaten away the armor allowing the water to enter, or that some similar accident has happened.

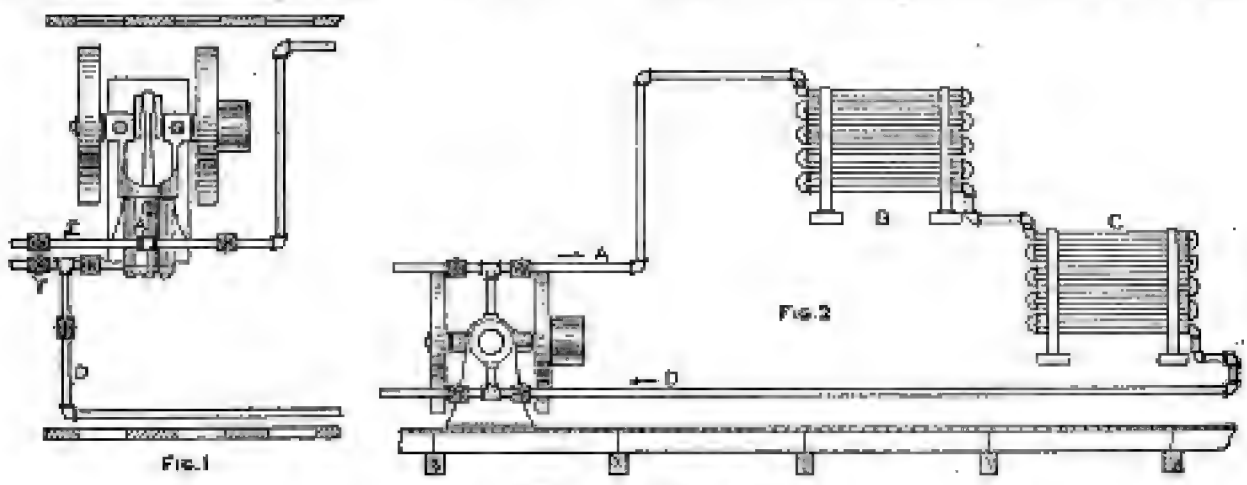
In aerial cables the troubles are many and varied, the main trouble being from "burn outs" caused either from high-potential crosses with the cable itself, or from lightning. Then there are the mechanical damages caused by bullets, knife cuts, spur holes, etc.

(To be continued)

Heating a Shop with Engine-Jacket Water

In a small shop operated by a gas or gasoline engine considerable expense can be saved in winter by utilizing the cooling water from the engine for heating purposes, says a correspondent of Power. The method employed is shown in Fig. 1, where A is the jacket-water outlet pipe, and D the cooling-water return pipe. The pipes E and F are the circulating pipes connecting the engine with the regular cooling tank, and B and C, Fig. 2, are the heating coils. Valves are provided to control the flow in all of the pipes.

To secure the most efficient operation of the system, the coils and piping should be arranged as shown in Fig. 2, as this arrangement gives better circulation than when the coils are placed on the same level.



Plan and Elevation of Piping System

If the volume of water passing through the heating coils be regulated by the valves in the supply and return pipes, the temperature of the room being heated may be varied to suit the weather conditions. It must be remembered, however, that when these valves are partially closed, the valves in the pipes E and F must be opened an equal amount to allow the engine to receive the required volume of cooling water.

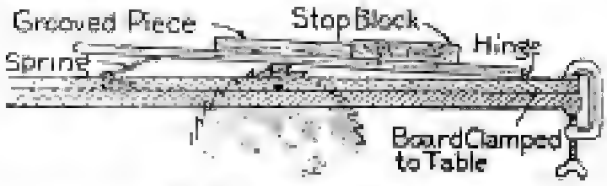
The amount of space that the system will heat depends, of course, upon the amount of cooling water passed through the engine jacket, and the power and efficiency of the engine. Under ordinary conditions, the quantity of heat carried away per hour by the cooling water is from 2,000 to 4,000 B. T. U. per brake horsepower. A fair average is 3,000 B. T. U. per brake horsepower and about one-half of this is available for heating. Multiplying this quantity (1,500) by the brake horsepower and dividing by the number of B. T. U. required per hour to heat 1 cu. ft. of free air from 20 to 75 deg. F. for ordinary climates (or from —25 to 75 deg. for cold climates) gives the number of cubic feet which the system will heat.

The number of B. T. U. required to heat 1 cu. ft. of air through the required number of degrees of temperature can be obtained from any standard book on heating and ventilation, and will vary somewhat with the construction and exposure of the building.

The heating coils should not be built haphazardly, but should be figured out beforehand by the use of some of the simple formulas found in books and catalogs on heating and plumbing.

Grooving Short Pieces on the Saw

The sketch shows how short blocks of wood may be grooved on the saw without danger of kicking back, thereby preventing accidents. The drawing will be understood at a glance by any woodworking mechanic, and the rigging can be made in 15 minutes. This method not only eliminates the possibility of injury to the operator's hands, but also makes it possible to do more work in the same time than by

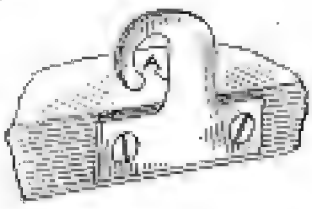


How to Groove Short Blocks

the old way of dropping the pieces on the saw.—Contributed by Henry Zahn, Chicago.

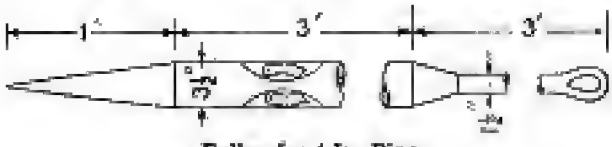
A String Cutter

The accompanying sketch shows a handy little string cutter for fastening to the edge of the counter. It is made of a thin piece of steel and the cutting edge A tempered and sharpened. The shape of the cutter forms a guard over the cutting edge and prevents anyone from being cut. It also allows the string to reach the cutting edge easily.—Contributed by Abner B. Shaw, N. Dartmouth, Mass.



Pipe Puller

A puller the right size to pull a 4-in. pipe must have the dimensions shown in the sketch. The main body is made of soft steel and the catches of tool steel tempered. The two catches are pivoted in notches milled in opposite sides of the main body in such a way that when the puller is lowered in the pipe, they will slip through, but, upon drawing the puller, the catches will



Puller for 4-In. Pipe

take hold on the pipe and pull it out. As many catches as are desired can be fastened to the puller.—Contributed by J. C. Talley, Rock Hill, S. C.

Mending Moving-Picture Films

A little device which gives the best results in repairing films, says a correspondent of the Moving Picture World, is made of steel, ¼ in. thick by ⅝ in.

Hinge Clamp

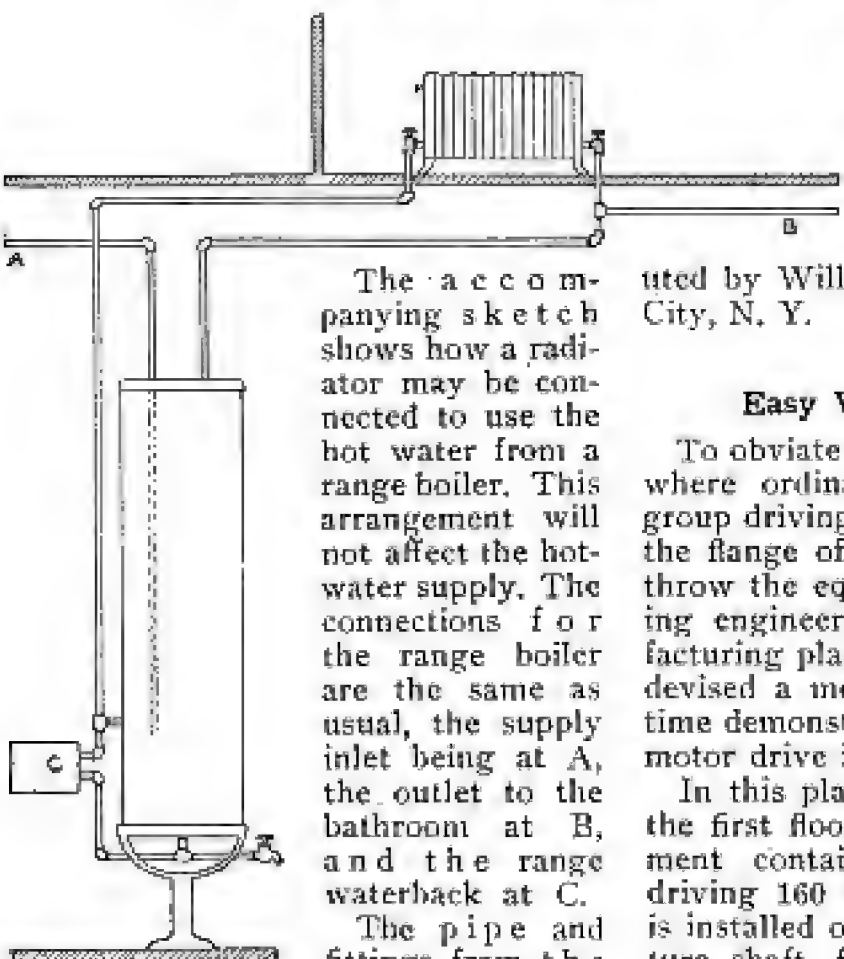
wide. Two pieces are hinged together as shown in Fig. 1. Small pins, the same shape as those on the sprocket of a moving-picture machine, are set in one half of the hinge, spaced the same distance apart as the two rows of perforations in the edges of the film. Two holes, A and B, are drilled in the other half hinge to receive the pins. This makes an effective press for the patch.

The ends of the film are prepared in the usual manner. The mend is made as shown in Fig. 2. This will not split the sprocket holes. If it is desired to split the holes, as in Fig. 3, then use more than one set of pins in the mending hinge.

¶A tool for cutting brass should have no top rake, but for cast iron it should have at least 5 deg. and for steel at least 15 deg. rake.

¶Small jugs, 1-qt. size, covered with crocheted wool make excellent hot-water bottles.

Connecting a Radiator to a Range Boiler



Connections from Waterback to Boiler and Radiator

The accompanying sketch shows how a radiator may be connected to use the hot water from a range boiler. This arrangement will not affect the hot-water supply. The connections for the range boiler are the same as usual, the supply inlet being at A, the outlet to the bathroom at B, and the range waterback at C.

The pipe and fittings from the boiler to the radiator and the waterback and return should be 1 or 1¼ in. The inlet pipe and the pipe supplying the bathroom can be the regular size for the boiler. The radiator will heat a good-sized room nicely.—Contributed by William Carroll, Long Island City, N. Y.

Easy Way to Shift Belts

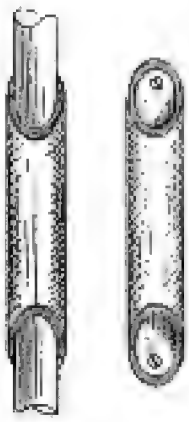
To obviate the tendency of the belts, where ordinary pulleys are used in group driving of machines, to slip over the flange of double pulleys and thus throw the equipment idle, the designing engineers of a big cotton-manufacturing plant at East Boston, Mass., devised a method which at the same time demonstrates the flexibility of the motor drive in special cases.

In this plant, according to Factory, the first floor of the spinning department contains forty 20-hp. motors driving 160 frames. A double pulley is installed on each end of each armature shaft, four frames being driven per motor, but instead of the usual flange on the double pulleys to separate the belts, the crowning on each

section is made ¼ in. off center, away from the middle of the pulley. By this means the belts are kept apart without any danger of their climbing the flange and being thrown off, and in addition, by centering these tight and loose pulleys on the frames with the highest point of the crown on the driving pulley, the belt can be shifted without throwing it off the motor pulley.

Broom Holder Made of Rubber Hose

A piece of rubber hose, 6 or 8 in. long, cut as shown in the sketch, and nailed or screwed to a wall, makes a handy broom holder. The hose should be tacked to the wall about 2 or 3 ft. from the floor, so that the broom handle can be pushed through from the top and rest on the floor. This holder is easily made and will give satisfaction.—Contributed by Irl R. Hicks, Hallsville, Mo.



Tamper Made of Pipe and Fittings

A very satisfactory tamper for earth can be made of a 1-in. pipe, fitted with a bushing and caps, as shown. The pipe should be about 5 ft. long. The bushing is used to secure a large tamping head.—Contributed by Earnest Boyce, Winterset, Iowa.

Tamper of Pipe and Fittings

Boring-Tool Sounder

When boring on a lathe it is quite hard to determine whether or not the tool is cutting properly. The instrument shown in the sketch will tell with a remarkable degree of accuracy. The instrument is made of a piece of ⅛-in. drill rod, about 13 in. long, set in an elliptical piece of wood, 1⅛ in. long and ⅝ in. in diameter in the largest part. A small fork is formed on the end, as shown in the sketch.

In using the fork, place it on the boring tool and place the wood knob close against the ear. If the tool is cutting a trifle out of the way, the vibrations will show it instantly.—Contributed by F. W. Shrier, New Haven, Conn.

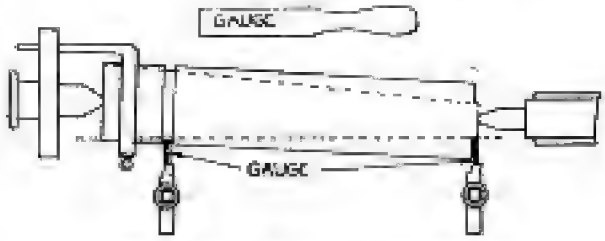
Sounder

A Safety Lathe Dog

The construction of this lathe dog is apparent from the illustration, from which it will be seen that the setscrew is so protected as to avoid the familiar accident due to the lack of such protection. The setscrew can be adjusted by the ordinary type of wrench, and should it become burred or damaged, can be readily renewed by the use of a socket wrench inserted through the hole in the protection frame.

A Gauge for Setting Centers in Taper Turning

It is not always necessary to know the amount to set over a tailstock on a lathe in turning tapers. A very easy way to set the work in the centers to turn a taper is to use a gauge as shown in the sketch. The first requirements



Gauge Used in Setting Taper Stock

are to turn a place to the right diameter at each end of the part to be tapered, then loosen the tailstock so that it can be easily moved. Set the gauge between the surface of the turned part and the cutting edge of the tool first at one end and then the other, without changing the crossfeed, but moving the carriage back and forth until the tailstock is set right to make it gauge the same in the cut at both ends. Set the clamp bolt on the tailstock and cut the taper.—Contributed by C. Gatter, Bridesburg, Pa.

Cutting Off Hollow Bored Cores

Cylindrical hollow steel bodies with bottoms can be made from the solid bar by boring out a core down to the inside of the bottom and using an undercutting tool to cut down to where the core may be broken off, as shown in Fig. 1. This method is applicable to all kinds of steel, says the American Machinist. It is especially advantageous, where valuable material is used, in saving the stock in the core, and, where the interior pressure is to be high, in simplifying the construction and reducing the cost.

The cutting-off tool for hollow core borings is shown in Fig. 2. Its construction is special. The body of the tool, A, is made of steel. A steel bolt is screwed into a milled eye and on this bolt a tool-holder, B, is pivoted, curved in conformity with the bore. The cutter C, of high-speed steel, is dovetailed into the holder. In the end of the holder there is a hole in which there are fastened two cords of very high-grade steel wire, with loose ends. The cords are led out through opposite eyelets in the tool body, parallel to its axis. The cord that is entirely visible in Fig. 2 serves to feed the cutter under. The smaller cord may be used to pull the cutter out of the undercut. The body of the tool is centered in the bore that has been made by four hardwood blocks, D, dovetailed into the periphery of the body.

The cutting off of the core is performed on the same machine that is used for the boring, Fig. 3. The cutting-off tool is attached in the same manner as the hollow boring tool, by means of threads on the hollow boring bar. The cord F, Fig. 3, used to feed in the cutting-off tool, is led over the pulley G, and wound on the drum I, which is driven by the feed rod H. For undercutting the core, the axial feed

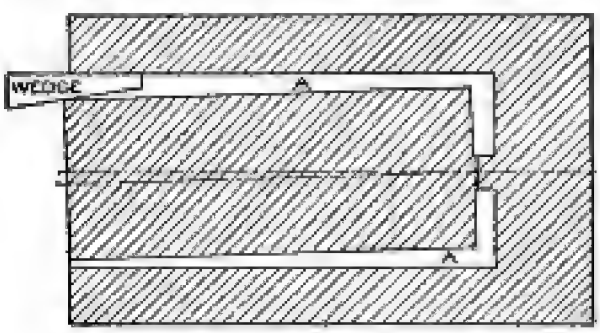


Fig. 1

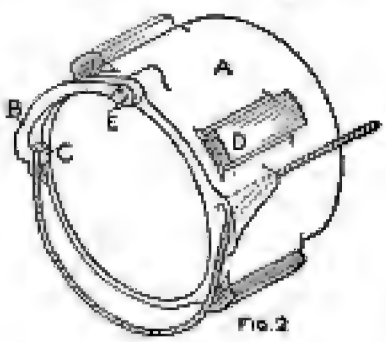


Fig. 2

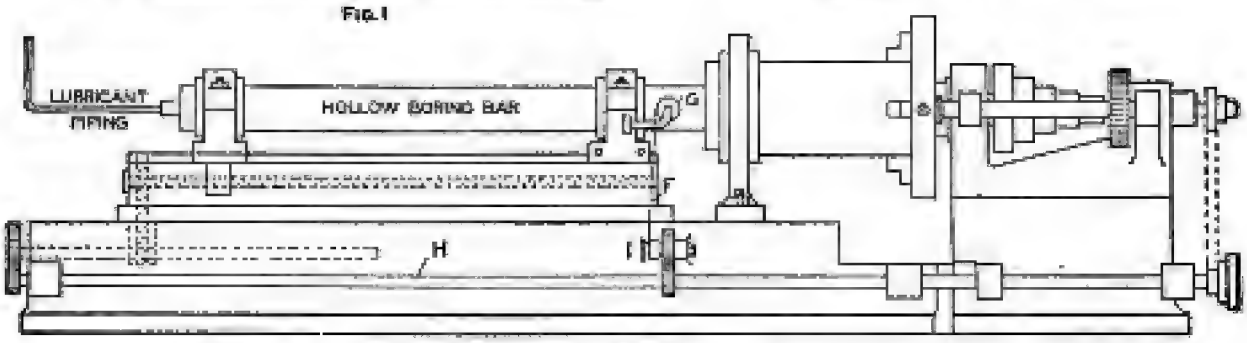


Fig. 3

Cutting-Off Tool and Its Position on a Lathe

of the hollow boring bar must, of course, be disconnected.

The cutting lubricant, composed of a mixture of water with a cutting oil soluble in water, is forced, under high pressure, through the boring bar, to wash away chips. It is of great importance to grind the cutter so that the chips do not roll off as long shavings, but break into small pieces.

Chip Magnet for Drill Holes

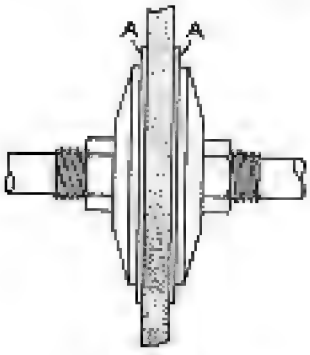
When drilling holes in parts that cannot be turned over, the little tool shown in the sketch cannot be excelled for removing the metal chips from the

Small Rod Magnet

bottom of the holes. It is made of a piece of ⅛-in., or larger, drill rod. The rod has a slot cut in it, as shown; then the steel is magnetized by placing on an electric generator, or, by wrapping a coil of insulated wire around the head end and passing an electric current from a battery through the wire. —Contributed by J. F. Tholl, Ypsilanti, Mich.

Mounting Emery Wheels

A way to lessen the chances of an emery wheel breaking is to use two rubber washers, AA, between the sides of the wheel and the nuts. In case the wheel should break, the greater part of the fragments are prevented from flying. I have tried this only on wheels up to 6 in. in diameter. —Contributed by Chas. Hattenberger, Buffalo, N. Y.



¶Window sash can be made to run smooth in the grooves by applying a solution of paraffin in turpentine.

An Emergency Tire-Lacing Needle

A needle for lacing the casing of a double-tube tire can be easily made of a piece of medium-weight wire

Needle of Twisted Wire

twisted as shown in the illustration. Such a needle is better than the ordinary steel needle as it can be bent to pass through the holes, and not being sharp, it is not so liable to puncture the inner tube.—Contributed by Paul H. Burkhart, Blue Island, Ill.

Wire-Cutting Notch in Shears

A small pair of pocket shears can be fixed to cut small wires by forming a notch in each blade, as shown at A in

Notch in Blades

the sketch. The notch does not interfere with the ordinary use of the shears.—Contributed by C. Irving Fisher, New York City.

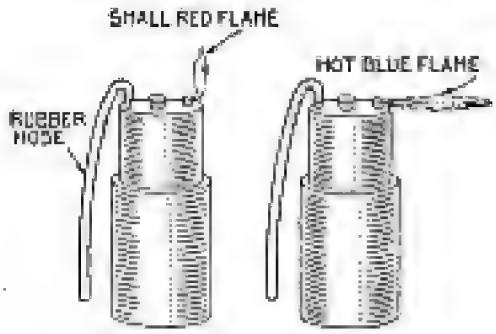
A Whitewash Mixture

Walls may be given a bright, clear white coating with a whitewash made up as follows: 1 teacupful of salt, 1 teacupful of brown sugar and 2 oz. of powdered blue vitriol are separately dissolved in hot water and then added to 1 pailful of water-slaked lime. Stir the parts together thoroughly. This will make a whitewash that will not rub or peel off.

The vitriol gives a bright, clear color. If a yellow tint is desired, use green vitriol instead of blue. The mixture will have a green tint, but when it dries on the wall it will be a nice yellow.—Contributed by Frank J. Lilja, Indian Orchard, Mass.

A Gasoline Torch

An old discarded gas generator used on a motorcycle served the purpose well in making a gasoline torch, says a

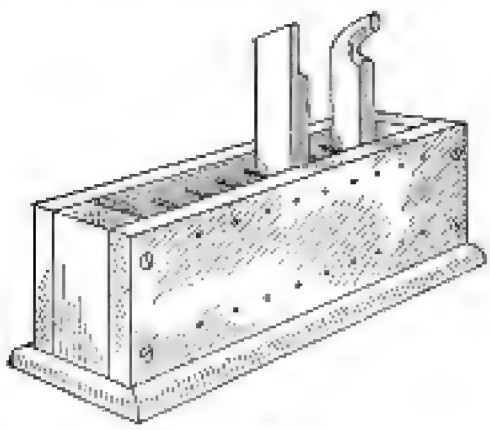


Connections to Tank

correspondent of Motor Cycling. I put a hose, 6 or 7 in. long, over the water pipe on top of the generator, and then lit the gas that escaped from the opening in the top. It burned with a small red flame. When blowing through the tube, it was changed into an intensely hot blue flame. This is a handy torch for a multitude of things where the ordinary gasoline blowtorch is generally used.

Stand for Lathe Tools

Lathe tools often become scattered, and even when they are laid in order, it is sometimes difficult to pick out the right one. To overcome this difficulty, the stand shown in the sketch was



Tools in Stand

made, in which the tools are kept upright and the points in plain sight. In addition to this, all the tools may be moved easily. No dimensions are given, as each stand will have to be made for each particular set and size of lathe tools. The stand will be of more use for small lathe tools.

The stand is made by clamping two sides together and laying out the holes, which are spaced so that the distance between them will be about $\frac{1}{16}$ in. larger than the thickness of the lathe tools. The lines of the holes are about as far from the edge of the side pieces as the pieces are thick. Each hole in the bottom line is directly under the corresponding hole on the top line, so that when the tool is placed in the stand it will be held upright. The holes for the crosspieces, which are wire finishing nails, are drilled through one side but not quite through the other, and must be a shade smaller than the nails, or else the nails will work loose and fall out. If the nails fit too tightly, the wood will split when they are driven in.

The end pieces are cut ⅛ in. wider than the largest tool and as long as the sides are wide. Small round-head screws are used to hold the sides to the ends. The base is ¼ or ⅜ in. larger all around than the main body and is rounded or chamfered on the four top edges. It is fastened to the body by countersinking a screw through it into each end piece.—Contributed by Donald A. Price, Wilmington, Del.

Drilling Holes in Metal

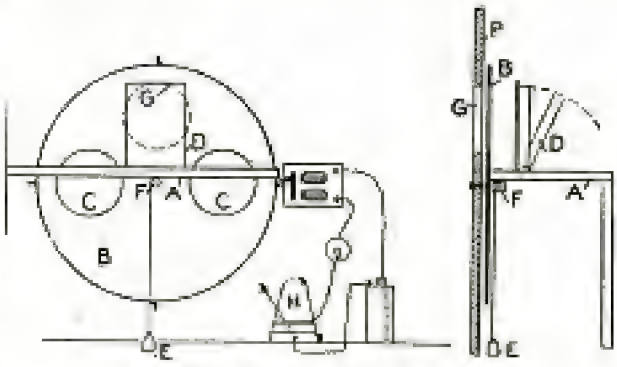
Starting a hole with a center-punch mark and drilling until the depression is gone, then using the punch again, is slow work on large holes and, besides, is not very accurate. I tried using a small drill and following with a larger one. Holes ½ in. in diameter can be drilled through very heavy plate in this manner without any particular effort. Start the hole with a ⅛-in. drill and follow with a ¼-in. drill. Holes can thus be drilled both quickly and accurately either by hand or on a makeshift drill press.—Contributed by C. W. Goddard, Bellaire, Mich.

Timing Photo Printing

Having hundreds of postals of a single subject to print, I made a perfect timing apparatus for exposing the prints from an old metronome and an old gong magnet. A disk, B, 20 in. in diameter, was made of heavy tin with two apertures, C C, each cut 7 in. in diameter, on a line with the center of the disk, and 2 in. from the edge. A large spool, F, was used to serve as a hub and also as a reel on which strong twine was wound, with a weight, E, attached to the free end.

The disk was bolted to the partition P of the darkroom, the partition having a hole, G, to coincide with the holes in the disk as it revolved. Four catch pins were fastened on the rim of the disk to engage a catch pin on the armature of the magnet. The gong and commutator were removed and the magnet placed in the position shown in the sketch. A strip of wood was fastened across the face of the metronome H, about 1 in. above the pendulum shaft or axle. On the inside of the center of the strip a small piece of wood was projected, with copper wire on one side only, to form a contact with a piece of flexible copper on the pendulum. Wiring was made as shown in the sketch and a switch used to stop the disk from revolving.

An ordinary postal-card printing frame, D, with a hinged back was used and placed on the shelf A, as shown. A hinge was made from heavy elastic bands to allow for two dozen cards in the frame at one time. As each card was printed it was taken out and dropped into the developer. The reel and metronome should be wound up after printing two dozen cards. The stops can be varied for any length of

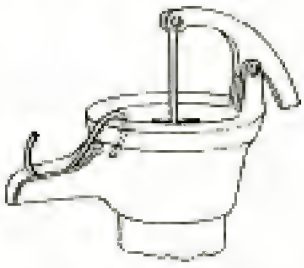


Details of Timing Apparatus

time by regulating the weight on the metronome. The disk and all woodwork must be painted a dull black. The circuit is completed on the return stroke of the pendulum, causing the magnet to attract the armature, which releases the catch, allowing a quarter turn of the disk.—Contributed by Frank W. Preston, Paterson, N. J.

Pail Hook for a Pitcher Pump

When pumping water from the ordinary pitcher pump, the bucket must either be held to the spout or placed on the ground. The accompanying sketch shows how I arranged a hook, fastened over the collar of the pump, to take the bail of the bucket. The hook is made of ¼-in. round iron.—Contributed by Laurence B. Robbins, Harwich, Mass.



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A Use for Discarded Wafer Razor Blades

A paper trimmer and mat cutter can be made from a wafer razor blade. As a paper trimmer, place the blade C over the part A of the razor, as shown, with only two of the holes engaging in one post and the center screw. Then place the part B in position and clamp with the handle. This will allow about ½ in. of the blade to project at one end. If a part of the extending blade is cut or broken off, it will be more easily handled. The cutter is guided along the straightedge as shown in Fig. 1.

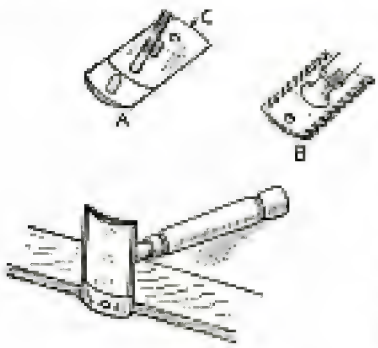

Fig. 1

If it is desired to make a more permanent form of instrument, or if no holder is at hand and only a castoff wafer blade, a handle, C, may be cut from a piece of wood and fitted with two or three binding-posts, A, taken from an old battery, to hold the blade B in place, as shown in Fig. 2.

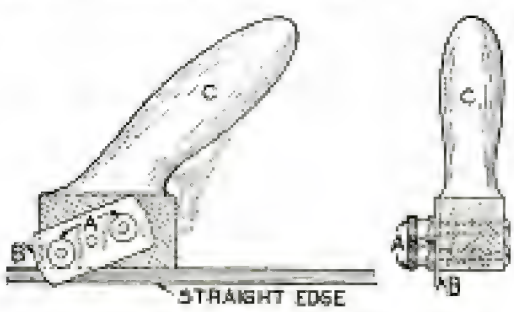

Fig. 2
Blade Attached to Handle

Armatures for Small Motors

Without the proper tools and material, the amateur electrician will find it quite difficult to construct a small armature for a battery motor that will run true, without vibration and have a neat appearance. Ordinary cast-iron gears or pinions, as shown in Fig. 1, make excellent cores for armatures on small motors. A gear of any number of teeth can be used for an armature with a smaller number of coils by cutting out a certain number of teeth. For example, a gear with 12 teeth will take 12 coils, but if every other tooth is cut out, it will take only 6 coils, etc. The teeth can be easily chipped out with a cold chisel.

Larger armatures can be made from gears with spokes, the spokes being cut out, if a ring armature is desired. The gear, when wound, can be mounted on a hub made of empty thread spools. The spool can be turned at one end to insert it in the armature, and if too long, one end will serve for the core of the commutator, as shown in Fig. 2.

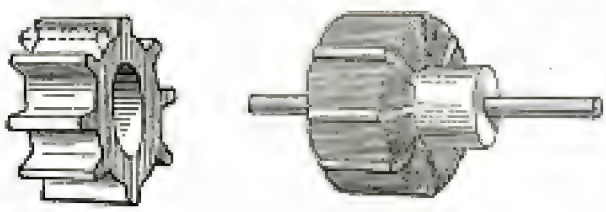
Fig. 1 Fig. 2
Gear Used as a Core

This combination will make a neat, efficient little armature, which will run quite free from vibration. Only simple tools, such as a hammer, cold chisel, file, jackknife and a vise, are required.—Contributed by R. J. Nault, Hartford, Conn.

Ice Creeper for Shoe Heels

Many persons, young and old, have falls every winter on the ice or snow which can be avoided if their shoes are fitted with ice creepers. A very efficient device of this kind, which any boy can make at home in a short time, is shown in the sketch. These ice creepers need not be removed from the shoes or boots until the winter is past, for they may be worn indoors without injuring the finest floor.

The two plates A may be made from either iron or steel—preferably the latter. An all-steel scraper, or a piece of a saw blade, makes good

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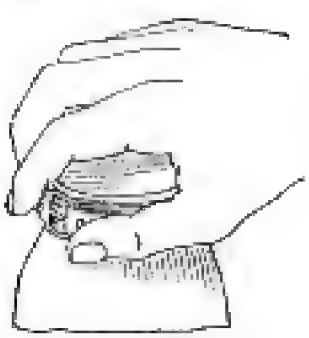
creepers. Draw the temper by heating the steel to a cherry red and then letting it cool slowly. It may then be sawn with a hacksaw, cut with a cold chisel, or filed into plates of the proper shape, as shown. The teeth are filed to points. The two L-shaped slots are made by drilling $\frac{3}{16}$-in. holes through the plates, and then sawing, filing or chiseling out the metal between the holes. The projections at the ends are then bent out at right angles with heavy pliers or the claws of a hammer, and finally the plates bent to fit the curve of the heel.

Creeper Attached to Heel

The creepers are attached by means of round-head wood screws turned into the leather. In this operation place the teeth of the plates just below the bottom of the heel and turn the screws into the ends of the upright slots until the heads just bind. The plate as set when indoors or else not needed is shown at B. To place the plate so it will grip the ice, slide it to the right, which will bring the screws into the horizontal slots, as shown at C.—Contributed by Chelsea C. Fraser, Saginaw, Mich.

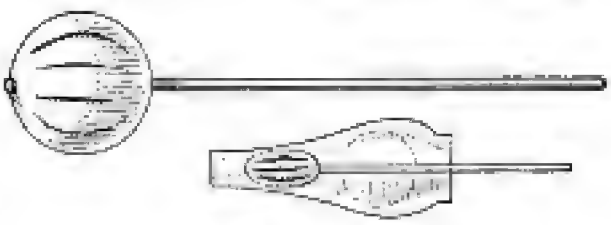
Opening Screw-Top Fruit Jars

Screw-top fruit jars may be easily opened in the following manner: Secure a strap with a buckle and place it around the top as if it were to be buckled, but instead draw the loose end back and hold it with the thumb as shown. Turn cover and strap while held in this position and it will easily turn from the jar.—Contributed by Chas. A. Bickert, Clinton, Iowa.



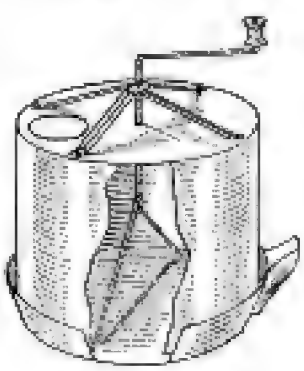
Lamp-Chimney Cleaner

Lamp chimneys of various makes are very difficult to clean quickly and thoroughly. The simple device shown in the sketch makes the cleaning process a simple matter. The cleaner is made of a round rubber ball with slits cut in it as shown and then fastened to the end of a stick. When a cloth is placed over the ball it presses evenly against the curved surfaces of the glass. There is no danger of breaking a chimney with this cleaner.


Rubber Ball on Stick

A Pop-Corn Popper

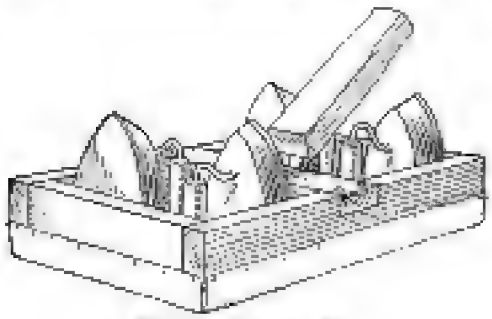
The accompanying sketch shows the construction of a pop-corn popper for thoroughly flavoring the corn with the hot butter or lard, and at the same time mixing it with the necessary amount of salt. Procure a metal bucket that just fits the bottom of the frying pan. The stirring device is made of heavy wire bent as shown and provided with an empty spool for a handle. A brace is made of tin bent in the shape shown and riveted to the bottom of the bucket.—Contributed by F. A. Wirth, Farwell, Texas.



A Homemade Floor Polisher

An efficient and cheap floor polisher may be readily constructed in the following manner: Make a box about 4 by 6 by 12 in., or the exact size may be determined by building it around

the household flatirons as these are used to give weight and pressure. The handle, which is attached as shown, should be at least 2½ in. wide



Flatirons in the Box

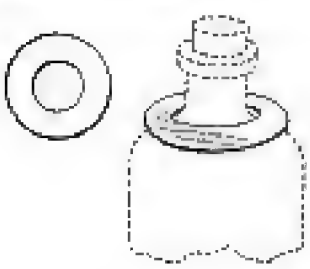
at the hinged end and should be sandpapered where it is grasped by the hands. A half-strap hinge is preferable, with the strap part fastened to the handle. The bottom of the polisher is covered with a piece of Brussels carpet.

In use, it is well to set the polisher on a soft piece of cotton or flannel cloth, which may be readily renewed when badly soiled.

A more sightly polisher may be made by filling the box with pieces of old iron or lead, tightly packed with paper to prevent rattling, and attaching a cover over the top. The handle may be hinged directly to this cover by means of a full-strap hinge.—Contributed by B. O. Longyear, Ft. Collins, Colo.

Simple Way to Mark Poison Bottles

A way to prevent any possible mistake of taking bottles containing poisons is to mark them as shown in the sketch. This method provides a way to designate a poison bottle in the dark.



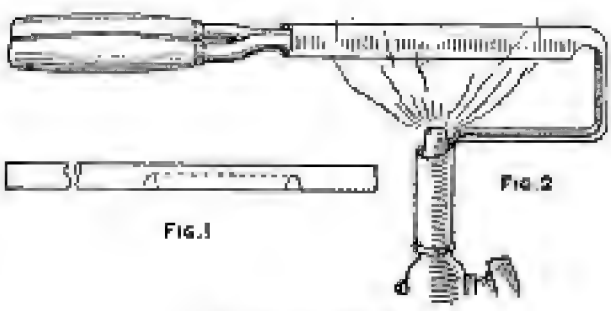
The marker is made of a circle of heavy cardboard with a hole in the center so as to fit tightly over the neck of the bottle. No matter how dark it may be or how much of a hurry a person may be in, one cannot fail to note the character of the contents of the bottle as soon as the hand touches the cardboard marker.—Contributed by Katharine D. Morse, Syracuse, N. Y.

Removing Varnish

A good and easy way to remove varnish from old furniture is to wash the surface thoroughly with 95-percent alcohol. This dissolves the varnish and the wood can then be cleaned with a strong solution of soap, or weak lye. If lye is used, it should be washed off quickly and the wood dried with flannel cloth. When the wood is thoroughly dry it will take a fine finish. —Contributed by Loren Ward, Des Moines, Iowa.

Curling-Iron Heater

The curling-iron holder shown in the sketch can be made of metal tubing



Heater on Gas Jet

having the size to fit both iron and gas jet. One-half of the tubing for a portion of its length is removed, as shown in Fig. 1. The remaining part is bent as in Fig. 2 and set on the burner of the gas jet.

The tube prevents the curling iron from becoming black with soot. The position on the jet may be changed. The tube can be placed on the jet and removed with the curling iron.—Contributed by W. A. Jaquythe, Richmond, Cal.

¶A whisk broom is the best cleaner for a gas stove. It will clean dirt from nickel parts as well as from the burner, grates, ovens and sheet-metal bottoms.

An Electrical Walking Stick

A cane that will produce an electric shock when shaking hands is one supplied with the electrical apparatus shown in the sketch. An ordinary cane, 1 in. in diameter at the top and having a metal band A, is bored about 8 in. deep, to receive the battery B and induction coil C. One of the electrical connections is through the metal tip D to the earth, the other is through the

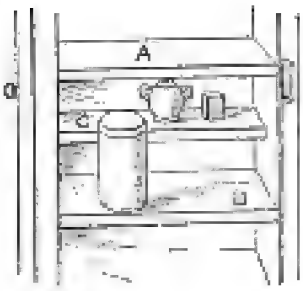
Battery and Coil in Cane

metal band A when the push button E is pressed.

The one using the cane merely holds the metal end D in contact with the earth and while shaking hands with a friend he pushes the button and starts the coil in operation.—Contributed by Stanley Radcliffe, Laurel, Md.

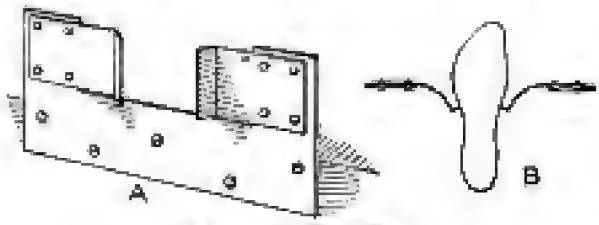
Convenient Shelf Arrangement

A convenient device for crowded shelves and cupboards is shown in the accompanying sketch. Halfway between shelves A and B is installed a second shelf C which is only half as wide as the other shelves. This provides a convenient place for small articles and utensils, while in a china closet it furnishes a splendid space for cups, sauce dishes or other small pieces. It also adds a neat and pleasing appearance.—Contributed by E. M. Williams, Oberlin, Ohio.



A Shoe Scraper

On steps of public buildings, shops and dwellings is usually found some sort of a mud scraper for the shoes. These remove the mud from the sole of the shoe and leave it on the edge and sides. The scraper shown in the sketch is of simple construction, and removes the mud from the soles and

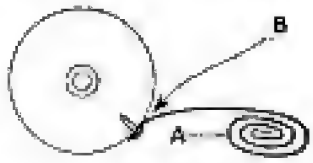


Scraper of Thin Steel

sides of any size shoe in one operation. The scrapers spread and bring pressure to bear on all sizes. The side scrapers must be made of metal that will spring. The standard is of heavy sheet metal with the thinner strips riveted to the projecting uprights at the ends.

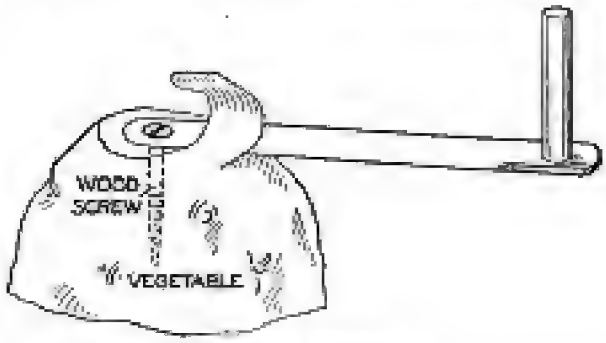
Fastening a Shade to a Roller

Tack the shade A in the usual manner and roll it as far back as possible and while in this position apply an ample quantity of glue near the tacks, as shown at B. A shade attached in this manner will not come loose from the roller.



Vegetable Slicer

The slicer is made of a knife blade, screw and pin handle. The screw is soldered into the end of the knife blade. As the screw feeds into the vegetable



Slicer in Vegetable

or fruit, the blade will slice it in a curl of even thickness.—Contributed by H. C. Roufeldt, Toledo, O.

Arts-Crafts Leather Work

By MARY C. SCOVEL

PART I

Coin Purse—Back

Coin Purse—Front

Leather work is one of the most interesting of the crafts, first, because the material is so pliable that anyone can work it, and secondly, because any ordinary article can be made by simply following the directions carefully, although each of the various kinds of leather demands a different process.

The equipment necessary is simple, consisting of two special tools costing 50 cents each, one with a narrow edge for lining patterns, and one with broad ends for tooling; and a piece of tin, plate glass, or very smooth hard wood, which should not be smaller than 9 by 12 in. A soft sponge, a triangle, a rule, tracing paper and a hard pencil are also needed.

The first attempt should be made on a piece of Russian calfskin. This may be purchased at any leather store or craft shop and costs about 50 cents a square foot, if cut to measure. Whole skins contain from 8 to 12 sq. ft. and cost about 35 cents a square foot. Calfskin may be had in almost any color.

A Mat

The coin purse will be the first article described. The size, pattern and design must first be determined. It consists of three parts, the front, back and flap, as shown in the sketch. This purse will require a piece of leather 4 by 8 in., in order to allow an extra ¼ in. outside of the pattern to pin the leather on the board while transferring the design. The upper flap C folds over the front of the purse D. The design must be divided, the part belonging to C placed on the flap, and the part belonging to the front D, on the lower part of the front.

Take a piece of paper and fold it in accordance with the desired proportions of the purse, taking care that the design for the front D is on the same side of the paper as that of the flap C. The space F under the flap is without any design. The design for the front D is on the lower part of the upper division of the pattern. Fold the part F behind H, and then the part C behind H and F. Turn the pattern over for the proper position of the purse. Draw the entire design on tracing or tough tissue paper. Wet the leather on the wrong or unfinished side with a soft sponge. Pat the leather and endeavor to moisten, but not soak it, with water. On some leather the water, if it comes through, leaves a stain. When the leather is too wet it is very hard to tool, as the tool sticks and makes an uneven background.

Pin the design firmly down against the leather and fasten the leather with thumb tacks on the outer margin.

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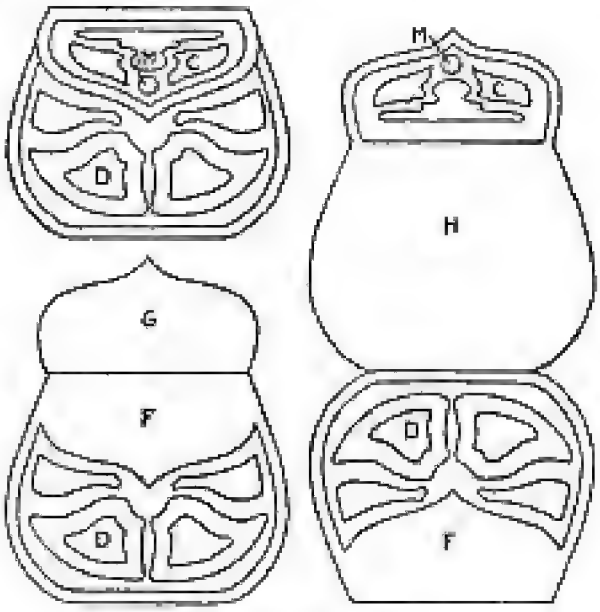
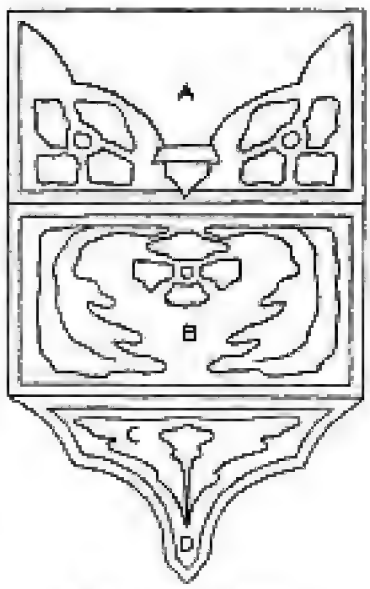
With a hard pencil go over every line of the design with a firm, even pressure. If the leather is properly moistened, this will leave a clear outline of the design when the tracing paper is removed. Then with a lining tool—the tool with the narrow edge—go over the lines on the leather with a strong, firm stroke. Should a line design only be desired, this operation finishes the decoration.



Pattern for Purse

Two other methods may be used: tooling or stamping. The design shown does not go to the edge of the pattern. A margin of at least 1/8 in. between the edge of the pattern and design must be left for tooling and stamping. For tooling, after lining the pattern, use the broad end of the tool and make even, long strokes to press down the background. If the background is not easily pressed down, the leather is too dry. Take it off the board and moisten the back again, move the tool back and forth and around until the background is comparatively smooth. Keep the edges very sharp between parts pressed down and those that remain raised. The depth of pressing down the background is a matter of taste, but it should be tooled down enough to make the design stand out plainly. Fold the parts together and line with silk to match the leather and then stitch up the front and back parts of the purse close to the edge. This can be done on any sewing machine, or by a shoemaker. The circle M in the pattern is the catch or button which can be furnished and put on by a shoemaker, or at a trunk store.



Stamp-Case Pattern

Any ordinary article of leather can be stitched on a sewing machine in the home. To do this successfully the stitch must be long and the needle of a large rather than a small size. Try the stitch on a scrap of leather before sewing the article. If the foot or feed of the machine mars the leather, place tissue paper or a plain piece of paper over the leather and stitch through both. After making the stitch the paper can be pulled away. Use as heavy a silk as the needle will take. The card case, coin purse, stamp case and bags can all be stitched on an ordinary machine, if the above directions are followed. In stitching any soft leather, such as ooze cow or ooze calf, if paper is not put between the leather and the machine, the stitching will stretch the leather. In making bags, instead of stitching on a machine one can punch holes close together with a small punch, and then with strips of leather sew the sides together over and over, or in any manner desired. If no machine is at hand, nor a shoemaker's shop nearby, a large pin or awl may be used to prick holes in the leather, and then the parts sewed together with needle and silk. Use a

running or over-and-over stitch. An over-and-over stitch from one end of the seam to the other and back to the beginning of the seam, makes an X-shaped stitch which gives a very good finish.

The second method after tooling is stamping. Line the pattern as described. Purchase a common carpenter's nail set, with the head not too large. The smaller sets fit the patterns better and make smaller circles. Moisten the leather as described. Use a wooden mallet to strike the tool in stamping the background. This may be done either along circular lines or in a more irregular manner, but avoid striking the tool too hard, as too much pressure cuts through the leather. Other stamping tools of good patterns may be purchased at hardware stores or crafts shops.

A needle book or stamp case is another handy article to make in leather. The sketch shows the design. A piece of Russian calf, 6¼ by 3¾ in., is necessary. This allows ¼ in. on each side and end for pinning down the pattern. Fold a piece of paper into three parts as A, B and C, the front being A; the back, B, which is folded underneath the part A. The flap C folds up with B and then over A toward the front. When the pattern is open, the design for all parts must be on the same side of the paper. The design for the back B is put on the leather upside down. When the pattern is folded this makes the design upright. The parts A, B and C are equal in length and width. The part C may be cut in any shape desired, but keep the tongue D long and narrow. Make two horizontal cuts in the front A about $\frac{3}{16}$ in. apart.

These cuts must be at the same distance from the bottom of the front as the narrowest part of the tongue is from the end. The tongue will then fit the cuts. Make the horizontal cuts a little wider than the tongue. The design is put on the leather in the same manner. It can be worked out in line, tooling or stamping. The parts A and B are sewed together.

The mat illustrated is another useful article and easy to make. Any size may be used, and the method of lining or tooling the design, or both, gives a very beautiful effect.

(*To be continued*)

How to Make a Wood Lathe

A strong, substantial lathe in which wood and light metal articles may be turned can be made by carefully following the description below and the detailed drawings of the parts.

The bed is made of two pieces of straight-grained, smooth, 2 by 4-in. hard wood, 5 ft. long. They are held apart at each end by blocks of wood 2 in. wide. The bed can, of course, be made longer or shorter if desired, but the above dimensions are very satisfactory. The frame of the headstock, Figs. 1 and 2, is made of hard wood. The two end pieces have the dimensions and shape shown. These are fastened with screws to the base.

The base has a slider, a strip of wood 1 in. thick and 10 in. long, wide enough to slide smoothly between the bed pieces, nailed to its bottom, 2 in. from the rear end. Two ½-in. holes are bored through the baseboard and slide. Two ½-in. bolts are run through these holes and through another slide and board which runs on the under side of the bed.

When the nuts on these bolts are tightened, the headstock is firmly clamped to the bed. A half-round, wedge-shaped piece is fastened with screws in the frame against the front end, to serve as a brace against any strain, and will also add to its appearance. The spindle is of tool steel or steel tubing, ¾ in. in diameter and 14 in. long. Threads are cut on one end.

A hardened steel collar, ¼ by 1½ in., is riveted on the spindle so it may turn against another collar of the same size on the headstock. Another collar is fastened with screws to the rear end

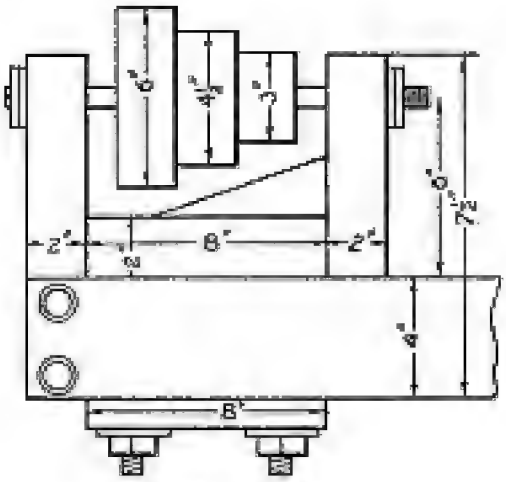


Fig. 1

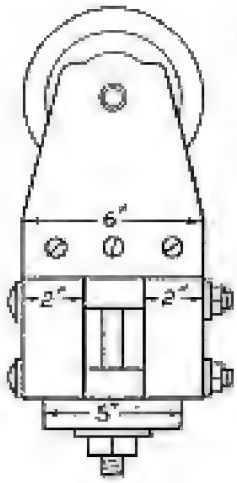


Fig. 2

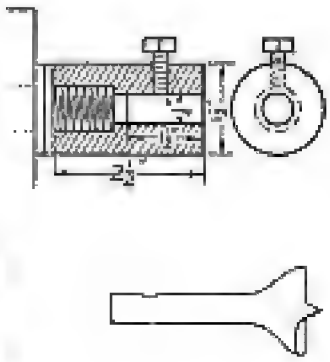


Fig. 3

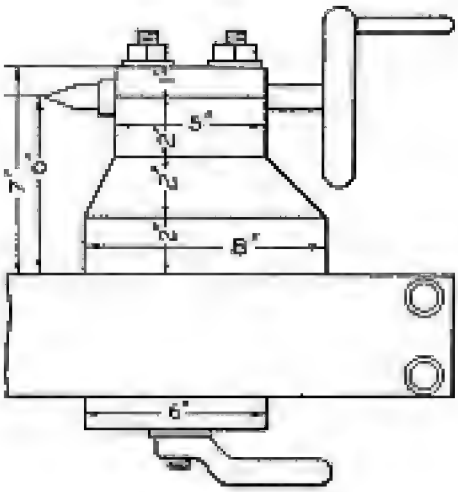


Fig. 4

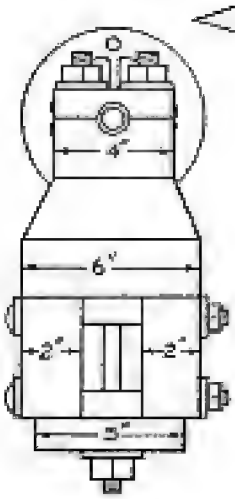
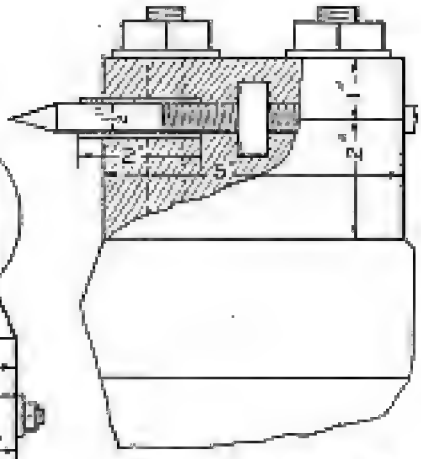


Fig. 5



SECTION THROUGH Fig. 4

Fig. 6

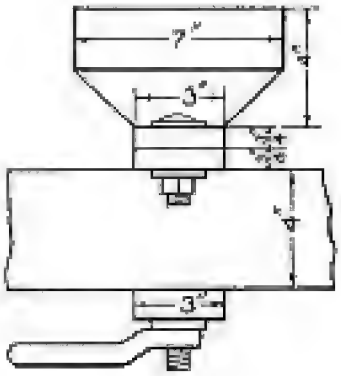


Fig. 7

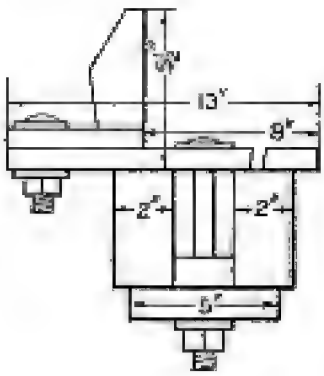


Fig. 8

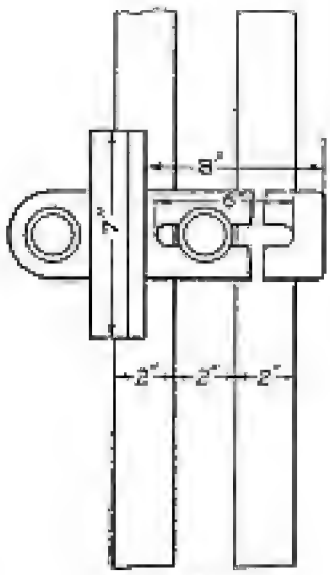


Fig. 9

Detail of Wood Lathe

piece, and a collar with a removable pin is fixed on the spindle. These should be fitted so as to revolve easily against each other and yet have no end play. The bearings are of brass tubing drilled for a spindle. These are inserted and wedged in the headstock, 6 in. from the bed.

Care should be taken to see that they are in line. Small holes are drilled from the top for oil. The pulleys are 2 in. wide with the diameters given in the drawing. They are fastened to the spindle with a removable pin.

A good chuck for this lathe is made, as shown in Fig. 3, of a piece of shafting 1½ in. in diameter and 2½ in. long. A ½-in. hole is drilled through its center and one end reamed out and threaded to fit the threads on the end of the spindle. A setscrew is fitted over the ½-in. hole. A center for turning wood is also shown. Many centers, drills, etc., can be made of ½-in. tool steel.

The tailstock, Figs. 4 and 5, is built up of three pieces of hard wood, 2 in. thick, and one piece, 1 in. thick, shaped as shown. These are held together with four bolts, 7½ in. long. It has sliders and is clamped to the bed in the same manner as the headstock, but only one bolt is used. A handle is welded to the nut. This will make the clamping easy.

A piece of tubing, 2 in. long, is drilled for a ½-in. dead center and inserted for 1½ in. between the two upper pieces, as shown in Fig. 6. A hole for a ½-in. bolt is bored through the sections so as to allow the bolt to slide freely in the tubing. The top section is taken off and a place chiseled out just back of the tube for a ½-in. nut. A bolt, 7 in. long and threaded for 2 in. of its length, is turned into the nut and tubing. A handle or wheel is riveted on the end of the bolt. The center is made of tool steel, ½ in. in diameter, with a tapering point. Other centers can be made of ½-in. tool steel.

The tool rest, Figs. 7, 8 and 9, has a slide, ¾ by 3 by 13 in., with a slot ½ by 6 in. The base of the rest is bolted on this slide so it can be adjusted. The rest is fastened on this base with screws. The height of the rest can be varied. It can be raised or lowered by inserting wedges between the slide and the rest base. The tool rest is clamped to the base the same as the tailstock.

The power for this lathe can be supplied by means of a countershaft, although a foot-power arrangement may be attached.—Contributed by E. E. Hulgan, Marion, Ind.

To Reduce the Gasoline Consumption of an Automobile

Quite recently I tried out a method of reducing the consumption of gasoline in my automobile, and, as a result, have higher efficiency without resorting to any of the numerous and exceedingly costly devices on the market.

I procured a piece of wire screen, cut it in the shape of the gasket between the carburetor and the intake manifold, but leaving it blind, that is, with the screen across the inlet. I put this between two gaskets and fastened the whole back in place. The result was an increase of 3 miles per gallon of fuel. —Contributed by W. J. Weber, New York City.

Cutting a Tin Ball from a Child's Finger

A three-year-old child found a globe of tin with a hole cut through the center, and—it is hardly necessary to state—immediately thrust his finger into the hole. But he could not get it out again, and the mother, accompanied by several other small children, brought the screaming child to my office. I found the hole had been punched, which caused three harpoon-like fragments to be carried into the center of the globe.

The mother in her attempt to remove it had caused the sharp points to enter the flesh of the finger in two or three places. Any attempt to pull

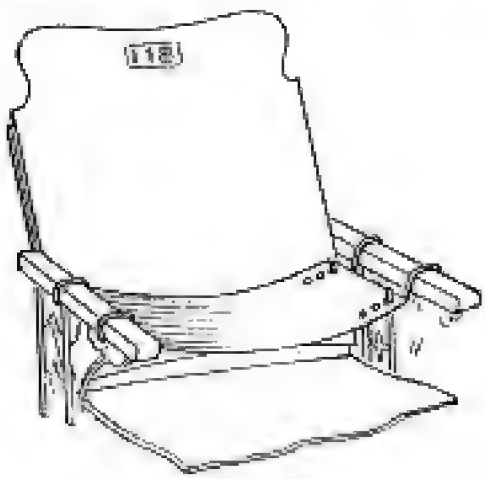
the ball off, drove the points of the harpoons deeper into the finger, and it was therefore a question of cutting the tin or the finger. But what kind of an instrument could I use on this tin globe?

I had nothing in my case that would cut it. My 35 years of medical experience gave me no help. The tin was as hard and smooth as a glass marble. Yet, it would have been ridiculous to be thus conquered by a tin whistle, so after some meditation I called to mind that I had a pair of heavy tinner's snips in the basement. By using the utmost care I succeeded in cutting a small incision in the round ball, and then with the points of the shears I cut the metal away from the finger.

Such an accident may come under the observation of any parent, and if so, he can use the same method to relieve the child where medical assistance is not near at hand.—Contributed by R. W. Battles, M. D., Erie, Pa.

Child's Seat for Theaters

As children must hold tickets for theaters the same as adults, but the ordinary chair is too low to permit a child to see the performance, an auxiliary seat such as shown in the sketch

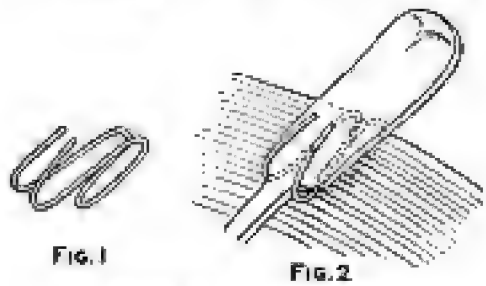


Seat in a Theater Chair

would sometimes be desirable as it elevates the child so its head will be on a level with those of other spectators. The seat is made of a strip of canvas with eyelets for wire hooks that fit over the arms of the ordinary theater chair. It is necessary to have extra eyelets at one end of the canvas to adjust it to varying widths of seats.—Contributed by W. A. Jaquythe, Richmond, Cal.

Holding Spoon on a Hot Dish

After repeatedly burning my fingers in the attempt to prevent the spoon from sliding into the hot dish, I de-

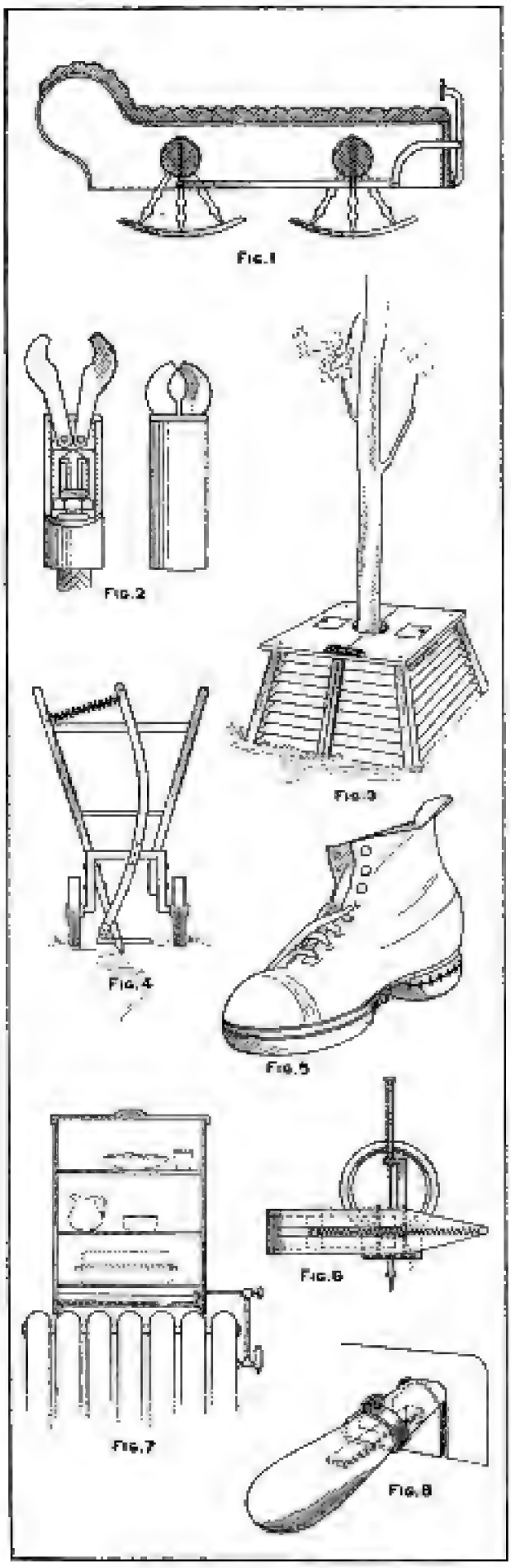


Spoon Holder on a Dish

cided to do a little inventing on my own hook. Taking a clean, straight hairpin I bent it to the shape shown in Fig. 1, and after hooking it over the edge of the dish, I placed the spoon in it as shown in Fig. 2, and my troubles were at an end.—Contributed by Miss Genevieve Warner, Kalamazoo, Mich.

Locating Gas and Electric Fixtures in the Dark

A gas or electric fixture in the center of a room is quite hard to locate in the dark; more so if it is a single-light pendant. The location may be easily found if the fixture is marked as follows: Coat small pieces of cardboard on both sides with phosphorus and suspend them from the fixtures with small wires. No matter how dark the room may be, the phosphorus on the cardboard can be readily seen. The phosphorus is the same as used on matches and can be obtained from any druggist. The phosphorus, being poisonous, should be handled as little as possible, and, after using, should be returned to the water-filled jar in which it was received when bought. If left in the open, it may cause fire.—Contributed by Katharine D. Morse, Syracuse, N. Y.



INTERESTING PATENTS,

A ROCKER-COUCH—An article of furniture thought worthy of a patent by an inventor of Asheville, N. C., is shown in Fig. 1. It is a rocker-couch, the body of which is supported by two sets of rockers. By means of foot pressure exerted against the lever at the lower end, the person reclining on the couch gives it a continuous rocking motion.

UNIVERSAL TERMINAL CLIPS FOR SPARK PLUGS—The opening in the brass jaws of this universal terminal (Fig. 2), is elliptic in form, giving secure hold on the thread of the plug in event of the top nut being lost. When the jaws are fully extended, the terminal will give a secure contact on a plug through the top cap in the event of the threaded post being broken off accidentally.

FRUIT-TREE VENTILATOR—Figure 3 shows a fruit-tree ventilator designed to circle the trunk of a tree at its base as shown. It is made in two sections, hinged at the back, and doors are carried in the top of each section to allow of access to the interior.

CHOPPER AND THINNER FOR PLANTS—One of the handles of this plant thinner (Fig. 4) terminates in a digger, and through a hole just above the digging point passes a blade, which is attached to a shift lever. The blade is arranged to actuate within the hole, a spring, extending between the upper end of the lever and one of the handles, keeping the blade-carrying end of the lever adjacent to the digging point. The machine is pushed along between the rows of plants in the same manner as an ordinary cultivator.

PNEUMATIC TREAD FOR SHOES—A low shoe, somewhat similar to an Indian moccasin in appearance, provided with an air cushion half-sole and heel, is shown in Fig. 5.

MAGAZINE-NEEDLE FEEDER FOR DISK PHONOGRAPHS—Figure 6 illustrates a device which facilitates the handling of the needles or points used with disk phonographs. The magazine, attached to an ordinary sound box or reproducer, holds 25 needles. After playing a record, all that has to be done is to push down the plunger and a needle is carried into the stylus or needle holder.

RADIATOR COOKER—A cooker for use with a steam radiator having an outlet passage provided with a relief valve for the escape of air or gas is shown in Fig. 7. The cooker comprises a main body or casing for holding articles to be heated or cooked, and pipe connections for conveying steam from the radiator to the cooker. The pipe contains a valve to control the passage of the steam.

FOR PREVENTING MICE FROM ENTERING PIANOS—The only unguarded openings through which mice can find an entrance into a piano are the pedal slots, and Fig. 8 shows a device designed to prevent this. Attached to the under side of the pedal by means of a band is an angle bar carrying at its inner end a plate, which normally closes the pedal opening in the foot board.

A DIRIGIBLE OF UNUSUAL DESIGN—Among the types of aerial craft being continually put forward by their respective inventors are many that are interesting simply because of some unusual idea of construction. Figure 9 shows such a dirigible, its unique point of interest being the house, windows and all, provided for the housing of the operating mechanism and for passengers. The inventor is depending upon two gas reservoirs and planes or wings for the lifting and control of his quaint craft. The upper chamber or attic of the house is open at both ends, and the current of air passing through this is expected to aid in sustaining the craft. The wings are attached to the corners of the house.

COIL-COOLED SMOKING PIPE—The inventor of this pipe (Fig. 10) believes he has solved the problem of a cool smoke. The distance between the bowl

PRACTICAL OR UNIQUE

and the mouthpiece is materially lengthened without lengthening the pipe stem, this being accomplished by utilizing a spiral tube as the smoke passage. The tube is connected with the pipe bowl through the base of the bowl and is twisted around a solid pipe stem.

* * *

AUTOMATIC HORSE-FEEDING MACHINE—Figure 11 shows an automatic device for feeding grain to horses, which is operated and controlled by the lips of the animal in obtaining a mouthful. It prevents the animal from obtaining too large a mouthful and thus gulping or wasting its feed. The feed, kept in a supply box placed preferably on the second floor of the stable, is fed to the feeding machine by means of a chute, the flow being controlled by a suitable valve. The bottom of the feeding machine terminates in a circular feeding trough, which is pushed around by the lips of the horse as he eats. This trough is formed with crosswise or radial webs at its bottom so that, when the horse inserts its nose in the trough, the movement of his lower jaw or lip in the act of obtaining a mouthful of feed rotates it, thus causing more feed to be automatically discharged into it. The feeder may be attached to a post or wall by means of its bracket.

* * *

WEIGHING SCALE—A weighing scale, made in both the postal and suspension types, but each having weights as a medium of balance, is shown in both types in Fig. 12. In the postal scale the standard is a combination of two telescopic members, and the telescoping of these members under the weight of the object placed upon the weighing table operates the weighted levers. In the suspension scale the same type of weight levers are used, but not the telescopic members. The supporting plate is held direct from the lever drums.

* * *

COMBINATION POLICEMAN'S CLUB AND EXTENSION REVOLVER BARREL—A policeman's club which will likewise serve as an extension barrel for his revolver is shown in Fig. 13. A long pistol barrel passes through the center of the club and has suitable means of engagement with the revolver barrel at its inner end.

* * *

GRAVITY-FEED EMERGENCY DEVICE FOR AUTOMOBILES—An emergency gravity-feed system for automobiles is shown in Fig. 14. An auxiliary supply tank is mounted near to and above the plane of the carburetor. A branch pipe extends from the main supply pipe to the auxiliary tank for refilling the same, and a check valve is located in the main supply pipe to prevent the return of the gasoline.

* * *

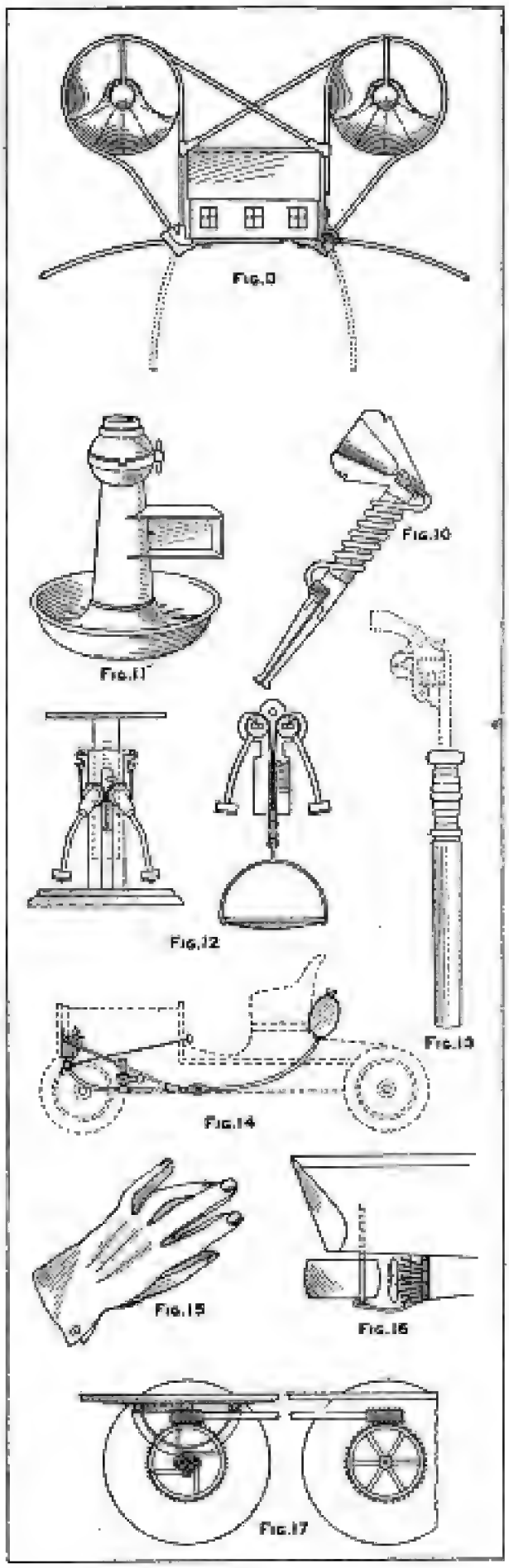
GLOVES PROVIDED WITH FINGER NAILS—Figure 15 shows a glove provided at the outer ends of the finger tips with separate rigid plates in imitation of finger nails. They are designed to provide extra protection to the ends of the fingers.

* * *

PROPELLER-GUARD—A guard designed to protect the propellers of small boats from objects which might break the blades or become entangled with them is shown in Fig. 16. It consists of a number of horizontal rods spaced as shown.

* * *

POWER-TRANSMITTING DEVICE FOR AUTOMOBILES—Figure 17 shows a means of power transmission for automobiles and other power-propelled vehicles, and particularly for motor plows. A motor-driven shaft runs longitudinally of the vehicle and is geared to both the front and the rear axles. The gear connection between the shaft and the rear axle includes a worm meshing with worm wheel keyed to the rear axle, while the gear connection with the front axle, which is the steering axle, consists of a worm on the shaft, which meshes with a worm wheel having a loose or swiveled connection with the front axle, whereby the front axle may swing or oscillate independently of the worm wheel. This flexible connection may also be applied to the rear axle if desired.



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A BALTIMORE school teacher had encountered such a degree of ignorance on the part of one of her boys in relation to the recorded acts of the Father of his Country, that she grew sarcastic.

"I wonder," she began, "if you could tell me whether George Washington was a sailor or a soldier?"

The boy grinned. "He was a soldier, all right," he said.

"How do you know?" the teacher challenged.

"Because I saw a picture of him crossing the Delaware. Any sailor would know enough not to stand up in the boat."

* * *

So, you have two offers of marriage? Whom are you going to accept?

Oh, well, I guess I will marry the aviator first.—L'Aero.

* * *

Bill Sprague kept a general store at Croydon Four Corners. One day he set off for York to buy a lot of goods. The goods were shipped immediately, and as Bill had lingered in York sight-seeing, they reached Croydon Four Corners before him.

The goods, in an enormous packing case, were driven to the general store by the local teamster. Mrs. Sprague came out to see what had arrived and with a shriek tottered and nearly fell.

"Oh, what's the matter, Ma'am?" cried the hired girl.

Mrs. Sprague, her eyes blinded with tears, pointed to the packing case, whereon was stenciled in large black letters:

"Bill inside!"—Boston Traveler.

* * *

The Salesman:—Here is a machine exactly suited to a man of your corpulence. You will never have to get under it to make any repairs.

Buyer:—Is that possible?

The Salesman:—Yes, sir. If the least thing gets out of order in the machinery, the auto turns over of itself.

* * *

Lady—What! Thirty-eight cents a dozen for eggs! Why, that's more than three cents for one egg!

Grocer—Well, mum, you must remember that one egg is a whole day's work for one hen.—Ideal Farmer.

A colored preacher was vehemently denouncing the sins of his congregation. "Breh'ern an' sistern, Ah warns yo' against de heinous sin o' shootin craps! Ah charges yo' against de brack rascality o' liften pullets! But, above all else, breddern and sistern, Ah demonishes yo' at dis hyer season against de crime o' melon stealin'!" A brother in a back seat made an odd sound with his lips, rose and snapped his fingers. Then he sat down again with an abashed look. "Whuffo, mah frien'," said the preacher sternly, "does yo' r'ar up an' snap yo' fingahs when Ah speaks o' melon stealin'?" "Yo' jes reminds me, pahson," the man in the back seat answered meekly, "wha' Ah lef' mah knife."—San Francisco Argonaut.

* * *

"Why," writes one of those propounders of unanswerable questions, "does a girl always shut her eyes when a man kisses her?"

Send us your photograph and perhaps we can tell you the reason.—Toledo Blade.

* * *

Lunatics often assume a superiority of intellect to others which is quite amusing. A gentleman, while walking along a road, not far from the side of which there ran a railway, encountered a number of insane people out for exercise. With a nod towards the railway lines, he said to one of the lunatics:

"Where does this railway go to?"

The lunatic looked at him scornfully for a moment, and then replied:

"It don't go anywhere. We keep it here to run trains on."—Domestic Engineering.

* * *

"When I order poultry from you again," said the man who quarrels with his provision dealer, "I don't want you to send me any of those aeroplane chickens."

"What kind do you mean?"

"The sort that are all wings and machinery and no meat."

* * *

"What's that you call your mule?"

"I call him 'Corporation,'" answered the old colored man.

"How did you come to give him such a name?"

"I'm studyin' de animal and readin' de papahs. Dat mule gets no' blame an' abuse dan anything else in de towuship, an' goes ahead lavin' his own way jes' de same."—Express Gazette.

NEW BOOKS

NEW YORK AIR BRAKE SYSTEM—374 pages; and **WESTINGHOUSE AIR BRAKE SYSTEM**—472 pages, form together a complete and up-to-date treatise on the two systems generally in vogue in America, with detailed descriptions of their various parts and a catechism of instruction in their construction, care and operation. The list of authorities consulted in the compilation of these two works offers a substantial guarantee of the correctness and thoroughness of the information and data given, and either or both should prove a welcome help to the prospective locomotive engineer. The books are uniform in size and appearance, 5½ x 8, cloth, and fully illustrated and indexed. Price $2.00 each. Frederick J. Drake & Co., Chicago.

* * *

THE UNITED STATES NAVY—By Henry Williams, Naval Constructor, U. S. N. A little book, primarily intended as a source of information for relatives and friends of young men contemplating to enter the naval service, but of interest also to others who would learn something about the organization, personnel and equipment of this branch of our national defense, and of its routine and functions in peace and war. 220 pages, 5 x 7½, cloth, illustrated and indexed. $1.50. Henry Holt and Company, New York.

* * *

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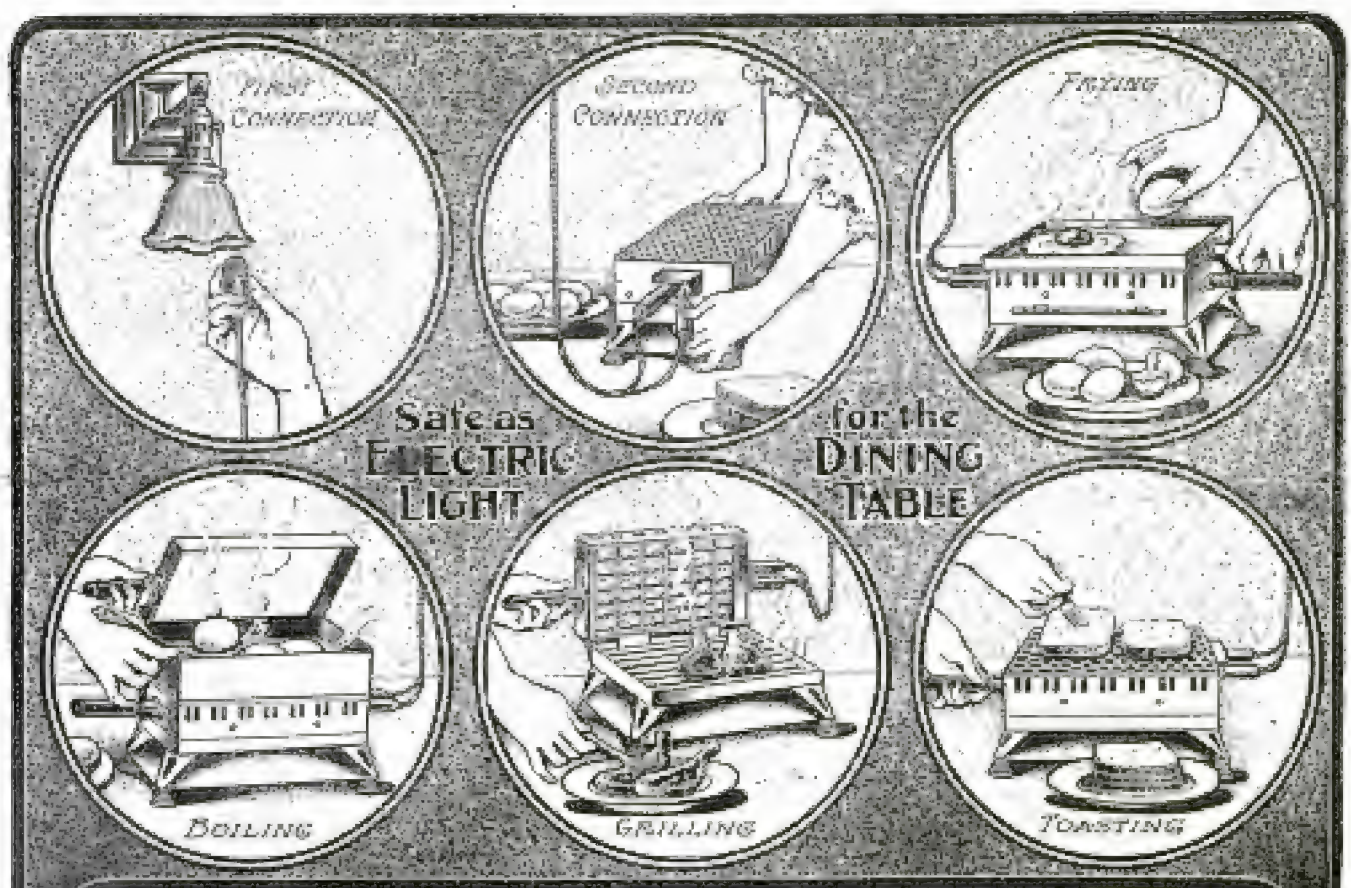
* * *

BEARINGS AND THEIR LUBRICATION—By L. P. Alford, M. E., Editor American Machinist. Deals exhaustively with the difficult subject of friction and how it is overcome constructionally and by the use of lubricants. The treatment is not so much theoretical, as practical, for the book gives the actual results obtained from tests with various materials and lubricants under varying conditions of application and usage, thus presenting the facts on which modern practice in the design of bearings is founded. 235 pages, 6 x 9, cloth. With index, numerous illustrations, diagrams and tables. $1.50 net. McGraw-Hill Book Company, New York.



A Few of Many Uses

The G-E Radiant Electric Grill

This new Electric Grill is really a miniature range that grills as well as fries, toasts, boils and bakes pancakes. Other small electric devices, boil, fry or toast but the G-E Radiant Grill is the first practical device that grills also.

Chops, steaks and fish are grilled *underneath* visible coils of wire that grow red hot the minute the current is turned on.

As shown above, the coil section can be lifted with one hand while the chop is turned or tested with the other. This Grill takes its electricity from *any* lamp socket, hence it is always ready for use. For the busy hostess, college girl, bachelor maid or bachelor, this Grill has a greater range of uses than any other electric convenience of its size.

The Heat Produced by "Calorite"

Of all the substances that change electricity into heat "Calorite" is the standard. "Calorite" is used *only* in G-E heating and cooking appliances—for example, in the half million G-E Flatirons in use everywhere. The "Calorite" heating coils in the G-E Radiant Grill insure its permanent superiority over all similar devices.

$8.50

Handsomely finished in nickel and supplied with frying pan, stew pan, and all necessary attaching plugs, etc., the G-E Radiant Grill sells for only $8.50. If your nearest lighting company or electrical supply dealer cannot show it to you, write us. Be sure to state the voltage of your lighting circuit.

"Electric Heating and Cooking," a 64-page book illustrated in colors, will be sent to any adult mentioning this advertisement.

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No-Rim-Cut Tires

Proved Average Oversize, 16.7%

Goodyear No-Rim-Cut tires are advertised as "10 per cent oversize."

We claim that this oversize adds 25 per cent to the tire mileage.

The actual oversize, over five leading makes, was lately **found to average 16.7 per cent.**

Note the table below.

Oversize is not measured by calipers. It is measured by air capacity. Air carries the load.

Note that only three tires in these 20 comparisons came within 10 per cent of our size.

That's because No-Rim-Cut tires have the hookless base. Your removable rim flanges, with these tires, turn **outward** instead of **inward.** Thus the tire has an extra flare.

Each one per cent oversize means one per cent extra carrying capacity.

Oversize means to save blow-outs—to increase tire mileage—to cut down tire expense.

Yet these oversize tires which can't rim-cut now cost no more than other standard tires.

Last Year

The sale of Goodyear tires exceeded the previous **12 years put together.**

We sold enough last year to **completely equip 102,000 cars.**

No-Rim-Cut tires now far outsell any other type of tire.

Just because these two features—No-Rim-Cut and oversize—cut tire bills right in two. And tens of thousands of users have proved it.

Comparison of Sizes Between Six Leading Makes of Tires

Rated Size	Make	Cubic Cap'ty	No-Rim-Cut O'ersize
30x3	1—No-Rim-Cut	**489** in.	
"	2—	402 "	21.5%
"	3—	381 "	28.4%
"	4—	371 "	31.8%
"	5—	383 "	27.5%
"	6—	365 "	34.0%
32x3½	1—No-Rim-Cut	**637** "	
"	2—	603 "	5.5%
"	3—	577 "	10.4%
"	4—	536 "	18.6%
"	5—	577 "	10.4%
"	6—	546 "	16.5%

Rated Size	Make	Cubic Cap'ty	No-Rim-Cut O'ersize
34x4	1—No-Rim-Cut	**858** in.	
"	2—	762 "	12.5%
"	3—	760 "	12.7%
"	4—	733 "	17.0%
"	5—	822 "	4.3%
"	6—	794 "	8.0%
36x4½	1—No-Rim-Cut	**1190** "	
"	2—	966 "	23.0%
"	3—	1064 "	11.8%
"	4—	1025 "	16.0%
"	5—	1055 "	12.6%
"	6—	1080 "	10.3%

Average No-Rim-Cut Oversize, 16.7%

No-Rim-Cut Tires

127 Leading Makers Adopt Them

For the year 1910, 44 leading motor car makers contracted for Goodyear tires.

For the year 1911, 64 makers came to them.

For this year we have contracts from the makers of **127 leading cars.**

That shows how car makers—the shrewdest of experts—have come to the Goodyear tires.

As for users, the demand in the past two years has multiplied six times over.

Tens of thousands of users have told tens of thousands of others how their tire bills were cut in two.

Now more motor car owners buy these patented tires than any other tires in existence.

Tires can never be made, in our estimation, better than Goodyear tires of today.

Then No-Rim-Cut tires make rim-cutting impossible.

With old-type tires—clincher tires—23 per cent of all ruined tires are rim-cut.

All that ruin is saved—all that worry avoided—by the use of No-Rim-Cut tires.

Even 10 per cent oversize, under average conditions, adds 25 per cent to the tire mileage. And our oversize, as shown by the table, averages 16.7 per cent.

These two features together—No-Rim-Cut and oversize—under average conditions cut tire bills in two.

The Saving

No-Rim-Cut tires are the final result of 13 years spent in tire making.

Year after year we have been constantly learning by wearing out tires on tire-testing machines.

We have compared in this way hundreds of fabrics and formulas, methods and processes, until we knew what was best.

No-Rim-Cut Tires

With or Without Double-Thick Non-Skid Treads

No Extra Cost

No-Rim-Cut tires, when first brought out, cost one-fifth more than other standard tires. Now they cost but an equal price.

So the saving they make is entirely clear.

That's why every tire user who knows the facts insists on No-Rim-Cut tires.

Our Tire Book, based on 13 years of tire making, is filled with facts you should know. Ask us to mail it to you.

THE GOODYEAR TIRE & RUBBER COMPANY, AKRON, OHIO

Branches and Agencies in 103 Principal Cities

We Make All Kinds of Rubber Tires, Tire Accessories and Repair Outfits

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More Than A Million Miles

FOR four years, individual owners have been putting their Winton Six cars through an exhaustive test. These owners have sent us monthly reports of miles traveled and repair expense incurred, and have sworn to the accuracy of their reports.

The result is a record of direct interest to men who own motor cars and pay repair bills.

For this record shows that, when you own a car as good as the Winton Six, you are practically free from repair expenses and from the annoyance and the humiliation that repair expenses carry with them.

World's Record Cars

Our complete records cover 170 cars, standard Winton Sixes, manufactured in 1907, 1908, 1909, 1910, and 1911.

Fifty of these cars made the world's lowest repair expense record of 22.8 cents per 1000 miles. We have already advertised these figures.

The natural thought is that the other cars "didn't do as well." But let's see.

Ran Without Expense

Sworn records show that 46 other cars (cars not included among the world's record cars) traveled 400,000 miles, averaging 8750 miles each, without incurring a single cent of repair expense.

These cars were not placed by the judges among the world's record cars because the world's record cars averaged a greater distance (14,800 miles each), and with so little expense that it was practically nothing at all.

Poorest Performances

Now consider the worst performances of all.

There were 27 cars whose repair expenses were high—$65.87 per car on total mileage of 300,000 miles, or 11,000 miles each.

Nothing much to be proud of in that record—because the other Winton Six records are so much better.

Still Other Cars

There were still other cars — 47 of them — among the 170. These 47 cars, not otherwise classified, traveled more than 425,000 miles, or 9000 miles each, at a total repair expense of $300, averaging $6.39 per car, or 70 cents per 1000 miles. A fine performance.

More Than a Million Miles

How exhaustive this four-year test has been is shown by the mileage.

Complete Record of All Cars Traveling 5000 Miles or More Each in the Four Annual Winton Six Upkeep Tests of 1908, 1909, 1910, and 1911

CLASSIFICATION	Number of Cars	MILEAGE		REPAIR EXPENSE		
		Total Miles	Average per Car	Total	Average per Car	Average per 1000 Miles
Cars making the world's lowest repair expense record	50	744,426.2	14,888.5	$ 170.27	$ 3.41	$0.228
Cars making the poorest records	27	299,695.1	11,107.2	1,778.42	65.87	5.93
*Cars running without repair expense	46	402,801	8,756.5	.....	.....	.....
Cars not otherwise classified	47	426,668.5	9,078	300.53	6.39	.70
Totals for four years	170	1,871,791.8	11,102.3	$2,249.22	$13.23	$1.20

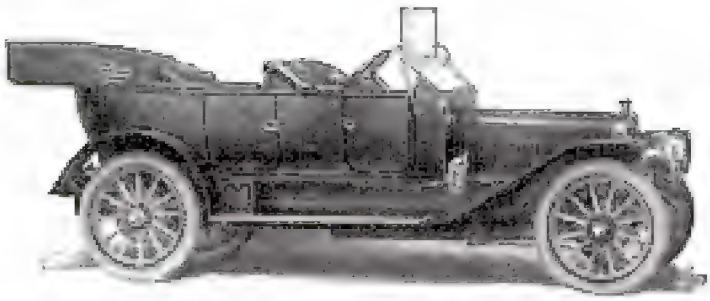
*Not included in any other classification.

All these cars ran in the individual service of their owners, who made sworn reports of mileage and repair expense

The Winton Co. guarantees every statement made in

WINTON SIX

advertising to be true without qualification.



These 170 cars averaged 11,000 miles each (more than three times the distance across the American continent), and traveled a total distance of 1,873,791.8 miles.

That's a distance almost beyond comprehension.

It is 580 times the distance from New York to Paris.

Or, almost 75 times the distance around the earth at the equator.

And nearly eight times the distance from here to the moon.

Wonderful Expense Figures

Sworn reports of the owners of these 170 cars place the total repair expense for this marvelous mileage at $2249.22, which is less than the purchase price of one Winton Six.

The average repair expense for each car was $13.23 for 11,000 miles, or—

Just $1.20 per car per 1000 miles.

And that's less than one-eighth of a cent per mile.

Expense is the Acid Test

Repair expense is the acid test of a car's merit.

As every owner knows.

For the merit that enables a car to keep down repair expense is in the *car itself.*

This test of more than a million miles, participated in by 170 Winton Six cars and 170 Winton Six owners, shows the merit of the Winton Six.

You would be happy if your car were a Winton Six.

Same Model: Fifth Year

We are the pioneer makers of sixes exclusively.

Our present model is the same car we have made for four years *without a single radical change.* Now in its fifth season.

It is the original self-cranking car: has been a self-cranking car since June, 1907. Our self-cranking motor is no experiment.

This car represents all the quality a motor car can have, and because we do business on bed-rock business principles we can sell it profitably at $3000.

If you want to know its worth, compare the $3000 48 H. P. Winton Six with cars priced as high as $5000 and $6000.

And remember that the Winton Six is the only car in the world whose repair cost is definitely known through the sworn statements of individual owners.

We shall be glad to send you our Upkeep Book that gives the million-mile facts and figures in detail, together with our thoroughly descriptive catalog.

THE WINTON MOTOR CAR. CO.

The World's First Makers of Sixes Exclusively

24 Berea Road, Cleveland—Sixth City

NEW YORK ..... Broadway at 70th St.
CHICAGO ..... Michigan Ave. at 13th St.
BOSTON ..... 674 Commonwealth Ave.
PHILADELPHIA ..... 246-248 N. Broad St.
BALTIMORE ..... Mt. Royal at North Ave.
PITTSBURGH ..... Baum at Beatty St.
CLEVELAND ..... 1228 Huron Road
DETROIT ..... 998 Woodward Ave.
MINNEAPOLIS ..... 16-22 Eighth St., N.
KANSAS CITY ..... 3324-3326 Main St.
SAN FRANCISCO ..... 300 Van Ness Ave.
SEATTLE ..... 1000-1006 Pike St.

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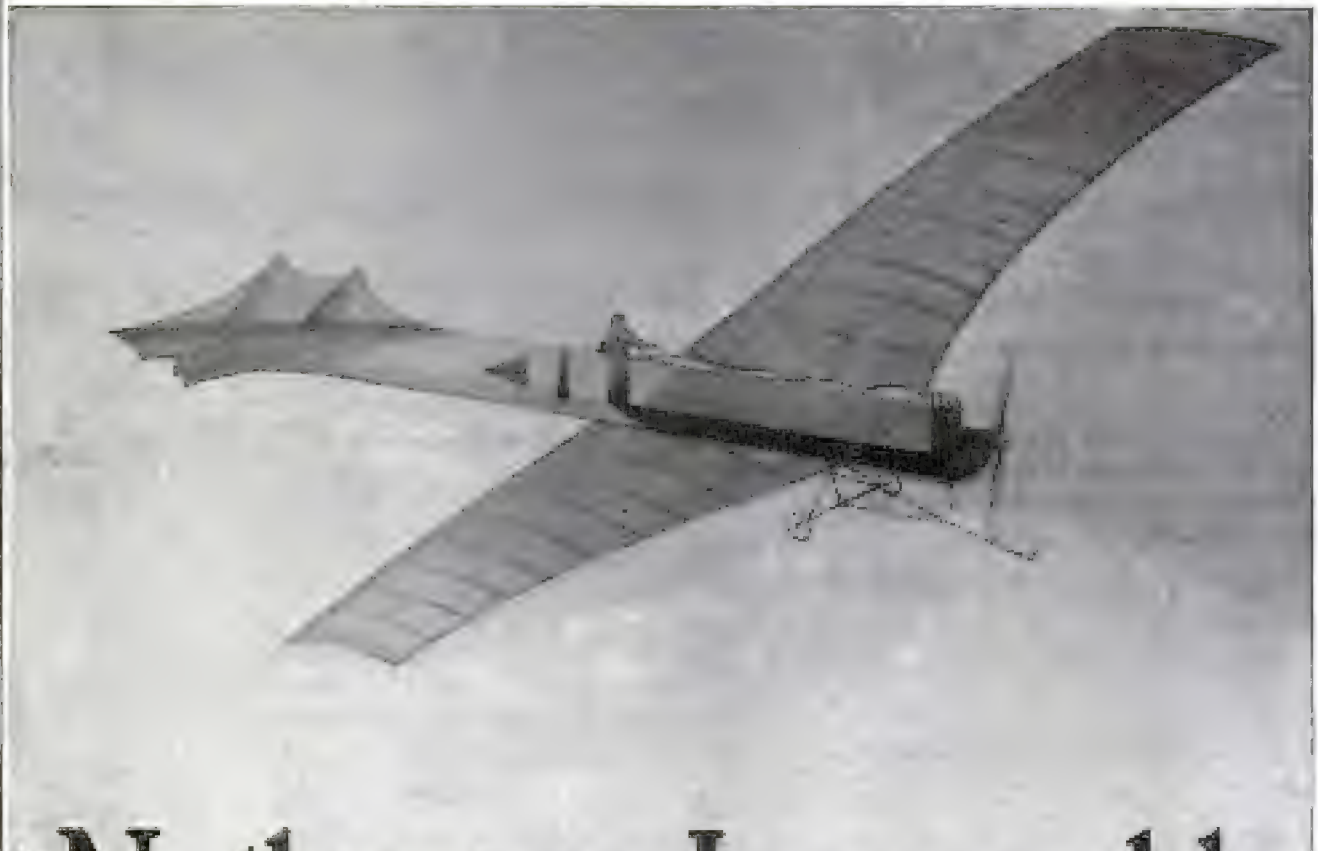

Nothing is Impossible

Nothing is impossible to the man with ambition! It does not make any difference what you want to do, there is a way to do it.

You may think it impossible to have your earning power doubled, tripled or quadrupled, but the realization of such an ambition is no more impossible than flying from New York to Los Angeles—telephoning from New York to Denver—or telegraphing without wires from San Francisco to Japan, all of which has been done within the last year.

Ambition knows no obstacles.

Ambition will find a way.

First say, "I *can* do it," then say, "I *will* do it."

When your *will* begins to work, nothing can stop you.

But your *will* must be directed by your mind. Train your mind along the lines of your chosen work. *Learn* more—and you will pass by all those who are satisfied with what they have.

To see how easy it is to do this, read the next page

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To the Man With Ambition

The International Correspondence Schools offer to men with ambition, the opportunity to make their dreams come true. Thousands of ambitious men are now taking this short cut to better positions—to greater home comforts—to a higher standing as citizens.

An hour of your spare time each day is surely a small payment for special training that will put you at the top of your business or profession.

Now if you have said, **"I CAN DO IT"**—say, **"I WILL DO IT,"** and the I. C. S. will help you to succeed. Just mark the coupon, for that is the first step.

This step will bring you, without any obligation on your part, all particulars as to how the I. C. S. trains you for success and the realization of your ambition.

Now is the time to start.

If you wait until tomorrow you have wasted a whole day.

INTERNATIONAL CORRESPONDENCE SCHOOLS
Box 872, SCRANTON, PA.
Explain, without further obligation on my part, how I can qualify for the position before which I mark **X**.

Automobile Running	Civil Service
Mine Superintendent	Architect
Mine Foreman	Chemist
Plumbing, Steam Fitting	Languages
Concrete Construction	Commercial English
Civil Engineer	Building Contractor
Textile Manufacturing	Architectural Drafting
Stationary Engineer	Industrial Designing
Telephone Expert	Commercial Illustrating
Mechan. Engineer	Window Trimming
Mechanical Draftsman	Show Card Writing
Electrical Engineer	Advertising Man
Elec. Lighting Supt.	Stenographer
Agriculture	Bookkeeper
Electric Railways	Cotton Manufacturing
Structural Engineer	Woolen Manufacturing
R. R. Construction	Toolmaking
Metal Mining	Foundry Work
English Branches	Pattern Making
Gas Engineer	Blacksmithing
Foreman Plumber	Surveyor
	Poultry Farming

Name _____

Present Occupation _____

Street and No. _____

City _____ State _____

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INVESTIGATION
UNDER THE
SPOTLIGHT
PROVES
THE VALUE OF
OUR

LATHES

MORE
FOR YOUR
MONEY
THAN CAN
BE HAD
ANY-
WHERE
ELSE

WE SAVE YOU

$25.00 TO $75.00

ON A LATHE
ACCORDING TO SIZE

OUR LATHES ARE MADE TO SATISFY EXPERT MECHANICS

THEY ARE GUARANTEED ACCURATE STRONG AND UNEXCELLED IN WORKMANSHIP

WRITE FOR OUR **Machinery Catalog "E"** MAILED FREE ON REQUEST

IT TELLS YOU WHERE TO BUY THE BEST MACHINERY AT THE LOWEST POSSIBLE PRICES

We Can Furnish Either Foot or Engine Power Lathes

ADDRESS SEARS, ROEBUCK AND CO., CHICAGO, ILL.

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$50. will tip the Scales

$5,000 a Year Income—Six Months Vacation

IF YOU are tired of the nerve-racking grind of the city: If you see no future before you: If you crave the outdoor life where you can work under cloudless skies, breathe fresh air and enjoy the balmy sunshine, we can interest you. We know we can for our proposition offers all that you have been longing for and very much more for it offers the way to secure a yearly income of $5,000 for life. It's a good business that permits six months of fishing, hunting or traveling with your family and provides plenty of funds to enjoy it, but that's what a full bearing apple orchard in the Bitter Root Valley will do. $50 and a present fair income will start you on the way. Are you ready?

Our plan of selling

Improved Orchard Tracts

practically amounts to *burning you $2,500 to $5,000* with which to buy and cultivate a 5 to 10 acre orchard on improved, well irrigated land, in *the most famous apple growing region in the world!*

The Sunnyside Bench Lands on which our tracts are located, are *the very garden spot of the Bitter Root Valley!* They are the best situated as to city advantages, schools, universities, churches and amusements. Big game abounds in the adjacent mountains, fine fishing is found in the waters of the valley.

You must get our printed literature, and read to appreciate the full details of the ideal soil and climatic conditions which make this region the finest apple growing region in the world; together with statistics of *undeniable facts of production*, all endorsed and supported by the highest authorities in the world, including government reports, horticultural experts and practical orchardists.

Everything Conducive to Perfect Fruit

Our tracts are abundantly irrigated from a great irrigation system costing nearly $4,000,000. The drainage is perfect. The apples grown there are hardy and perfect—as one government official observed, "*not one worm in a hundred thousand boxes,*" big, bright, sound, toothsome fruit, ideal for export as well as domestic markets.

There are *no destructive frosts; wormy fruit and crop failures are unknown.* Transportation facilities splendid, social atmosphere and living conditions ideal, climate perfect, cool nights and long, sunshiny days. Everything that tends to health, happiness and prosperity.

$5,000 Yearly for Life from 10 Acres

A Bitter Root apple orchard bears commercially in its fifth year. Ten acres, fully developed, will return you during early maturity, strictly net, a profit of from $2,000 to $5,000 yearly. Beginning with the tenth year from planting, judged by experience of others, 10 acres will net you an income of $5,000 yearly and employ only half your time.

If you have a fair-sized income now and are willing to improve your condition, **you do not need capital** to possess one of these big-paying orchards.

Our Proposition and Plan

briefly stated, is this: We will sell you *a choice 10 acre Orchard Home Tract*, **already planted** (spring of 1911) to best standard varieties (all apples, or apples and cherries)—**with the company's definite, written contract** to care for and develop your orchard under expert horticultural supervision for 5 years from date of planting, including all land taxes and irrigation charges—for $500 an acre.

The land will easily be worth, conservatively stated, in fair comparison with other improved lands, $1,000 an acre. *There's* a clean profit to you of 100% on a 5 year investment, at the outset. Only a $50 cash payment required now to secure your orchard tract—balance in easy payments divided over a ten-year period. Your payments for the next few months are practically *all* the cash outlay you will have, **as your orchard tract will pay for itself during the buying period and yield you a handsome profit besides!**

Fractional orchard tracts of 5 acres and over at proportionate prices and easy terms—($25 monthly for 5 acres.)

Our orchard contracts contain the fairest and most liberal features ever offered you.

Responsibility of Our Company

We are the largest orchard planters and growers in the Northwest.

Our guarantees and contracts are as good as bonds for we have assets of over $5,000,000; our lands are paid for; we are not hampered with debts, encumbrances or other "promotive" needs. We have plenty of money *to finance both ourselves and our buyers. Buying these Bitter Root Valley Orchard Home Tracts is like buying government bonds on easy payments*—except that the returns are infinitely larger, and you are at the same time making a future ideal home for yourself and family!

Here is the chance of a lifetime you have been looking for—it demands your consideration. We invite your fullest investigation. START TODAY by writing for our FREE ILLUSTRATED BOOK and get the whole interesting story.

BITTER ROOT VALLEY IRRIGATION COMPANY

R. S. LEMON, General Sales Manager

838 to 846 First National Bank Building, Chicago, U. S. A.

Please Mention Popular Mechanics

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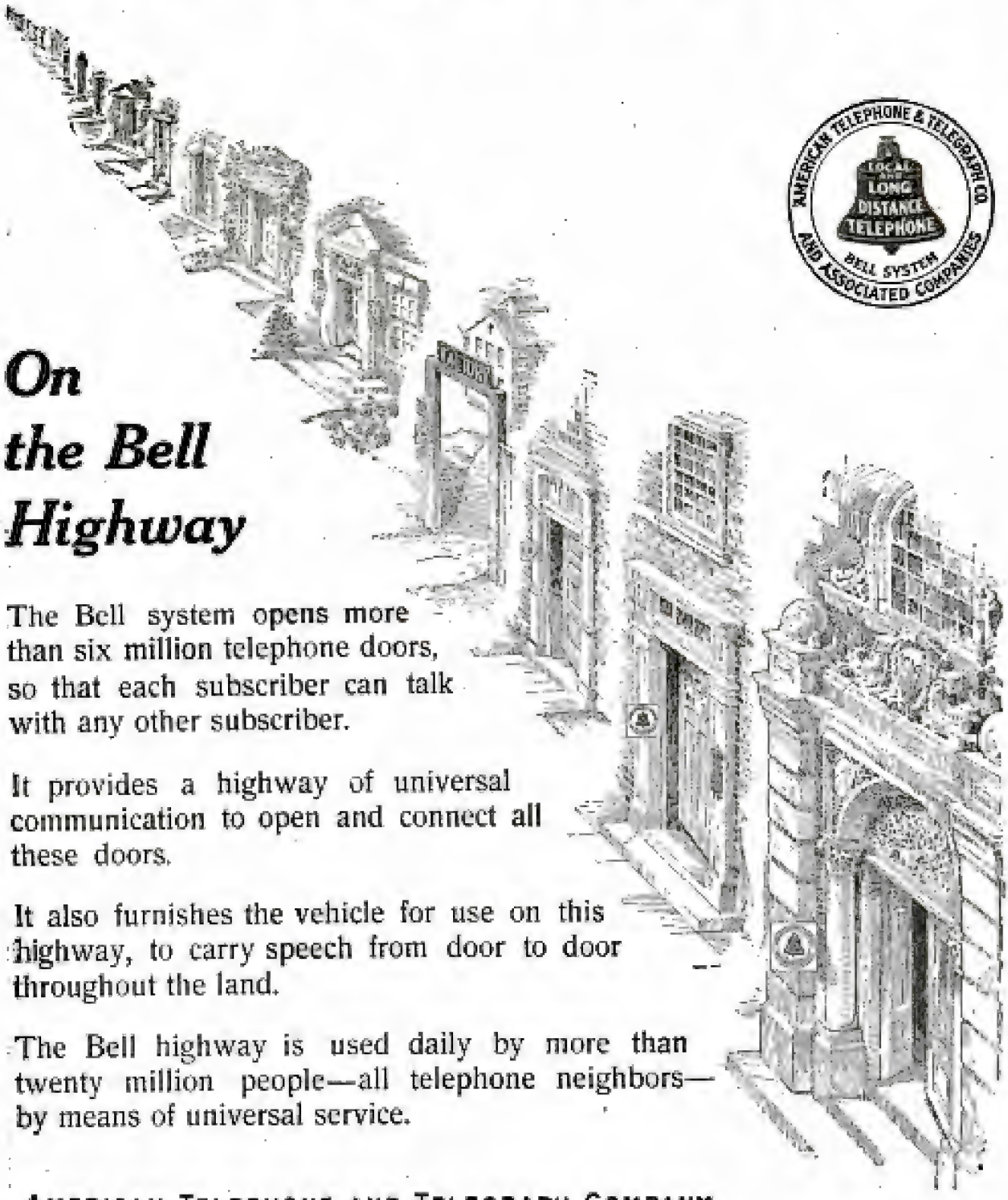
The Open Doors



On the Bell Highway

The Bell system opens more than six million telephone doors, so that each subscriber can talk with any other subscriber.

It provides a highway of universal communication to open and connect all these doors.

It also furnishes the vehicle for use on this highway, to carry speech from door to door throughout the land.

The Bell highway is used daily by more than twenty million people—all telephone neighbors—by means of universal service.

AMERICAN TELEPHONE AND TELEGRAPH COMPANY
AND ASSOCIATED COMPANIES

One Policy ***One System*** ***Universal Service***

Please Mention Popular Mechanics

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My Famous Anti-Nicotine Pipes at Forty Cents Each, Three for a Dollar

Or Two Pipes and My Fifty Cent Lighter for $1.00

Handsome Models!

I want thousands to know how a smoke can be improved by the construction of a pipe and by the materials put into it.

SMOKERS talk about the flavor, aroma and smoothness of tobacco. I know tobacco—so listen to me. A lot of that flavor, a lot of that aroma and a lot of that smoothness is *made* or *killed* by the pipe you smoke. Everybody knows it. I know men who have spent years trying to find a pipe they could smoke—and who today consider my scientifically-made Anti-Nicotine Pipes simply wonders! Some of them have actually given up other forms of smoking.

My Pipes Kill the Poison as Well as Improve the Smoke

Here's my original Anti-Nicotine Pipe at the top of this advertisement, and my new Anti-Nicotine Calabash Pipe at the bottom of this advertisement. In both these pipes I put the famous bowl that does the work—that makes the nicotine disappear. This bowl is made of a material as old as the Babylonians, a material that is like clay, a special composition first discovered by the ancients. This material is as hard as any clay, but it has a peculiar porous quality—just like the finest meerschaum—which *absorbs* the nicotine, keeps it out of your system and uses it to give the pipe a beautiful meerschaum coloring. I know that this special low price cannot blind you to the *quality* in these pipes. I know that the value to the health and enjoyment of my customers of these perfectly-made pipes, will get me twenty more customers every place that I send one now.

ANY THREE FOR A DOLLAR

Above is my popular clawdesign—the kind you see at the rich men's clubs. And below I show my new Calabash, modeled after the original African Calabash Gourd, graceful and highly finished, trimmed in German Silver. The claw design colors like the finest Meerschaum; the Calabash colors and looks *exactly* like the genuine African article which sells anywhere from $3.00 up. With them there is no burning the tongue—no charred wood fumes—no disgusting odor—and you do not have to "break them in." Any three for a dollar. Choose two of one design and one of the other, or all three of the same—just as you desire. I will sell these pipes to you at 40 cents each or three for a dollar. Order now—know that if you are not entirely satisfied, your money will be returned cheerfully. This offer holds good for this time only. Send the Coupon now.

My handsome Illustrated 1912 Smokers' Book sent FREE with every order.

H. MENGES
The Smoker's Friend
650 Menges Bldg.
ST. LOUIS
MO.

THIS HANDY POCKET LIGHTER

50 cts. Alone With Two Pipes $1.00

CUT OUT AND MAIL TODAY

This is Design A, Calabash is Design B

H. MENGES
650 Menges Bldg.
St. Louis, Mo.

Enclosed find 40 cents for one, $1.00 for three of your Anti-Nicotine pipes or two pipes and pocket lighter. Please send Design A.....Design B.....(State how many of each design wanted.) It is understood that if I do not like the pipe or pipes I am to return the goods and receive my money back in full. For the Lighter alone send 50 cents.

NAME.....

ADDRESS.....

TOWN.....

STATE.....

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Next to your choice of a car, your choice of a lubricant is the most important thing. Poor lubrication will ruin the best car in the world.

POLARINE is the oil on which you can always depend for efficient service.

"We'll be all right now; I've got some POLARINE."

CARBON PROOF. **Polarine** FROST PROOF

Polarine meets every fair demand that can be made on it, no matter how severe. It never thins out and loses its body.

It makes your motor deliver every possible ounce of power, with lessened friction and wear.

It puts an end to your troubles with carbon deposits on cylinders, valves and spark-plugs.

What Polarine Oil is to the motor, Polarine Transmission Lubricants and Polarine Greases are to the other wearing surfaces of your car.

FULL EFFICIENCY. ABSOLUTE UNIFORMITY.
PERFECT LUBRICATION.

Send for the Polarine Booklet to the nearest agency of the

Standard Oil Company
(Incorporated)

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"You're the man I want"

PRESIDENT: "You're the man I want! And I want you to know why I chose you from among the 40 men who were after the job."

YOUNG MAN: "I would like to know, sir."

PRESIDENT: "There were several men with records just as good as yours, but—you are the cleanest cut man of the bunch. I want to have men like you around me, and I'm not ashamed to have your kind represent the house. My rule is, *clear the way for the man with the clear record and the clean look.* Remember that, young man, remember that, if you want to get ahead."

There you have it! Promotion to the "clean cut" man; the man with the clear skin. Is your skin clearer, cleaner and more wholesome than the average? Don't be content with soap-and-water cleanliness. Be "Pompeian clean." Discover for yourself how Pompeian Massage Cream makes a healthy, attractive skin because of its marvelous powers to cleanse the pores and exercise the facial muscles.

POMPEIAN MASSAGE CREAM

Here is the test that has made millions of enthusiastic users of Pompeian. Get your face just as clean as old-time methods will permit. Then apply a pinch of Pompeian to your face. Rub it gently, but firmly. It disappears into the pores. Massage a moment longer. Out comes the Pompeian, and with it comes the hidden pore-dirt. The darkened, dirt-laden cream astonishes you. That was the dirt which soap and water couldn't reach.

All dealers 50c, 75c, $1

Make the test. If it doesn't convince you of the merit of Pompeian and its necessity as a complete cleanser of the face pores, then we have nothing more to say. A skin which is "Pompeian clean" means a clear, clean, fresh complexion. "Clear the way for the man with the clear record and the clean look. Remember that, young man, Use Pompeian." All dealers.

TRIAL JAR

Sent for 6c (stamps or coin). Find out for yourself, now, why Pompeian is used and prized in a million homes where the value of a clear, fresh, youthful skin is appreciated. Clip coupon now.

Cut along this line, fill in and mail today

The Pompeian Mfg. Co., 149 Prospect St., Cleveland, O.

Gentlemen:—Enclosed find 6c (stamps or coin) for a trial jar of Pompeian Massage Cream. (M)

Name .....

Address .....

City ..... State .....

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NEW YORK OFFICE, 359 BROADWAY

FOR SIXTY-FIVE YEARS the firm of MUNN & CO. has conducted the largest patent practice in the country. We file thousands of applications for patents every year. Our system is so perfected that every case receives the best of attention and is prepared by experts who have had special training in handling every class of invention.

¶ SEND SKETCH. If you will send us a sketch, no matter how crude, we will give you a fair and candid opinion as to whether it is probable a patent can be obtained. All matters of this kind are strictly confidential and the description and sketches will be dated and placed in our secret archives for future reference. This service and our Hand Book on Patents are free if you will write us at once.

¶ QUALITY. The quality of our work has given us an unrivalled reputation among Patent attorneys and we are the recognized American attorneys for many leading Foreign Patent Solicitors. Our staff consists largely of Examiners from the United States Patent Office, who are therefore familiar with the latest procedure and the best practice. Our draftsmen are all expert mechanical constructors who are able to show the invention in operative form.

¶ FREE NOTICE. All patents secured through our house receive a free notice in the SCIENTIFIC AMERICAN. No better or more economical method of introducing your invention to the attention of the public could be devised.

¶ OUR OFFICES. Our Washington office is located in our own building, near the Patent Office. This permits of our attorneys making special oral arguments with the Patent Office Examiners—an advantage not enjoyed by local attorneys.

¶ We are prepared to conduct Interference Proceedings, Infringement Suits, give Validity Opinions, draw up contracts and attend to all branches of legal work connected with Patents, Trade Marks, etc.

¶ We do not offer prizes or other specious inducements, but rely upon our recognized reputation of over half a century. Our fees are as low as is consistent with good work.

MUNN & CO., *Attorneys*

359 Broadway, New York, N. Y.

WASHINGTON OFFICE
625 F Street, N. W.
Washington, D. C.

WASHINGTON OFFICE

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You Can Have this Chair for 3 Cents a Day!

3 CENTS A DAY

for this leather seat rocker, beautifully grained, panel top, heavy front posts, quarter-sawed oak, genuine Leather Seat.

This is addressed to you regardless of your position

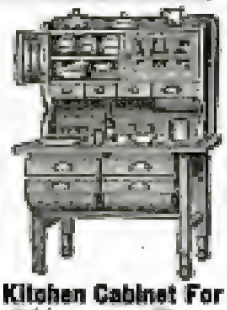
It is as important to the family whose income is $6 a week as to those whose income is $6,000 a year.

It makes no difference where you live, or how you are employed, we want you to know the best way—**the new way**—of buying home furnishings.

We have over a million customers. Our customers increase as more people learn our way of doing business, because they find ours the most profitable, dignified way of shopping by mail. Our million customers furnish their homes from our catalog—buy what they want—when they want it—pay as convenient.

For 3 Cents a Day you may have the splendid rocker shown at the top of this advertisement. It will prove one of the best investments you ever made. The smooth running guides assure perfect and easy action, and the heavy construction makes it extremely durable. Your local dealer would have to ask about double this price.

For 8 Cents a Day you can have **all** the articles illustrated. This includes the splendid rocker—the bed outfit—and the kitchen cabinet. All are best workmanship and we guarantee our price will save you up to 50%.



Kitchen Cabinet For 2½c a Day

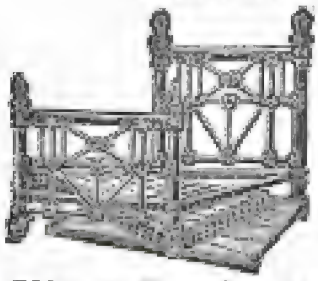
Hard wood, oak front, nicely finished, 63 inches high, 42 inches long, latticed glass doors.

We Sell Everything on Charge Account

Our business is conducted on an original "charge account" plan. We now have charge accounts with satisfied people in all walks of life, including:

Plumbers	Telegraphers	Laborers	Mechanics
Lawyers	Draymen	Merchants	Brick Layers
Seamstresses	Mill Hands	Firemen	Carpenters
Railroad Men	Teamsters	Housewives	Etc., Etc., Etc.

So you see this business is **"a business for the people."** We sell to all classes and **everyone** is welcome to an open charge account for whatever they require or desire.



2½c a Day buys this high grade iron bed, with fine cotton top mattress and woven wire springs. Can be furnished in any solid color.

A Year to Pay

Our customers take an average of twelve months to pay for what they buy. Some take longer—some less—depending upon the amount of their purchases. There is no interest to pay, no notes to sign—no contract or mortgage, no extra charge of any kind—"charge account" prices the same as for cash.

The World's Greatest Home Furnishers

Do Not Buy From Pictures

Our customers see **the goods themselves**—in their homes, if pleased they keep them—if not they return them and we pay freight **both ways.** Perhaps you'd like to see the bed—the kitchen cabinet—chair, or a rug—a pair of lace curtains—or a diamond—a watch—necklace—or a bracelet—no difference what you want—or where you live. **We take all risk of pleasing you.**

There is no village so small—no spot so remote—that has not had our Home Lovers Bargain Book. We do not employ salesmen—investigators or collectors. Our business is handled **entirely by mail—direct** with our customers—and in the strictest of confidence. This policy has built this **the largest business of its kind in the world.**

CATALOG FREE!

We want you to refer to our catalog whenever you think of home furnishings. It tells all about our plan of selling on charge account—it explains our thirty day free trial—about our wonderful organization—how we undersell retailers and all others. It shows pictures of high grade furniture and home furnishings—remarkable bargains that you will be interested in. Write for it—now—before you forget it. The book will be sent **free.** Your copy is waiting your request. Unless you write for it now—while you are reading this advertisement you may forget. (Better read that last sentence again.)

Spiegel, May, Stern Co., 1755 W. 35th St., CHICAGO - ILL.

MAIL THE COUPON TODAY

Spiegel, May, Stern Company
1755 W. 35th St., Chicago, Ill.

Gentlemen:—Send me copy of your new Home Lovers Bargain Catalog of home furnishings explaining our "charge account" plan. I understand you'll send this free and postpaid, and it is sent to me without any obligation on my part to buy.

Name.....

City.....State.....

Address (Street, R.F.D. or Box No.).....

A POSTAL CARD WILL DO if you do not want to cut your magazine.

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Go to the nearest hardware store and ask to see this P. S. & W. Guaranteed Samson Brace. Take it in your hands and feel the well-balanced weight, note the fine finish of the steel sweep and coco-bolo center, and the graceful appearance.

P. S. & W. TOOLS GUARANTEED

Then test out the tremendous gripping power of the big chuck. It fits the hand comfortably, releases and tightens with a twist of the wrist—but holds any round, square or taper drill shank in its alligator jaw tighter than you can get it with a vise in an ordinary brace.

Then turn the head on its noiseless bearings (steel balls, not shot) and note how the lignum vitæ head is protected from splitting by a steel cap (not cast-iron plate) surrounding it to a height of 5-16 of an inch.

This fine tool is but one item in a large line of guaranteed P. S. & W. Hand-tools for Carpenters, including braces, chisels, gouges, squares, calipers, etc.,—all made by us and branded with

The MARK of the MAKER

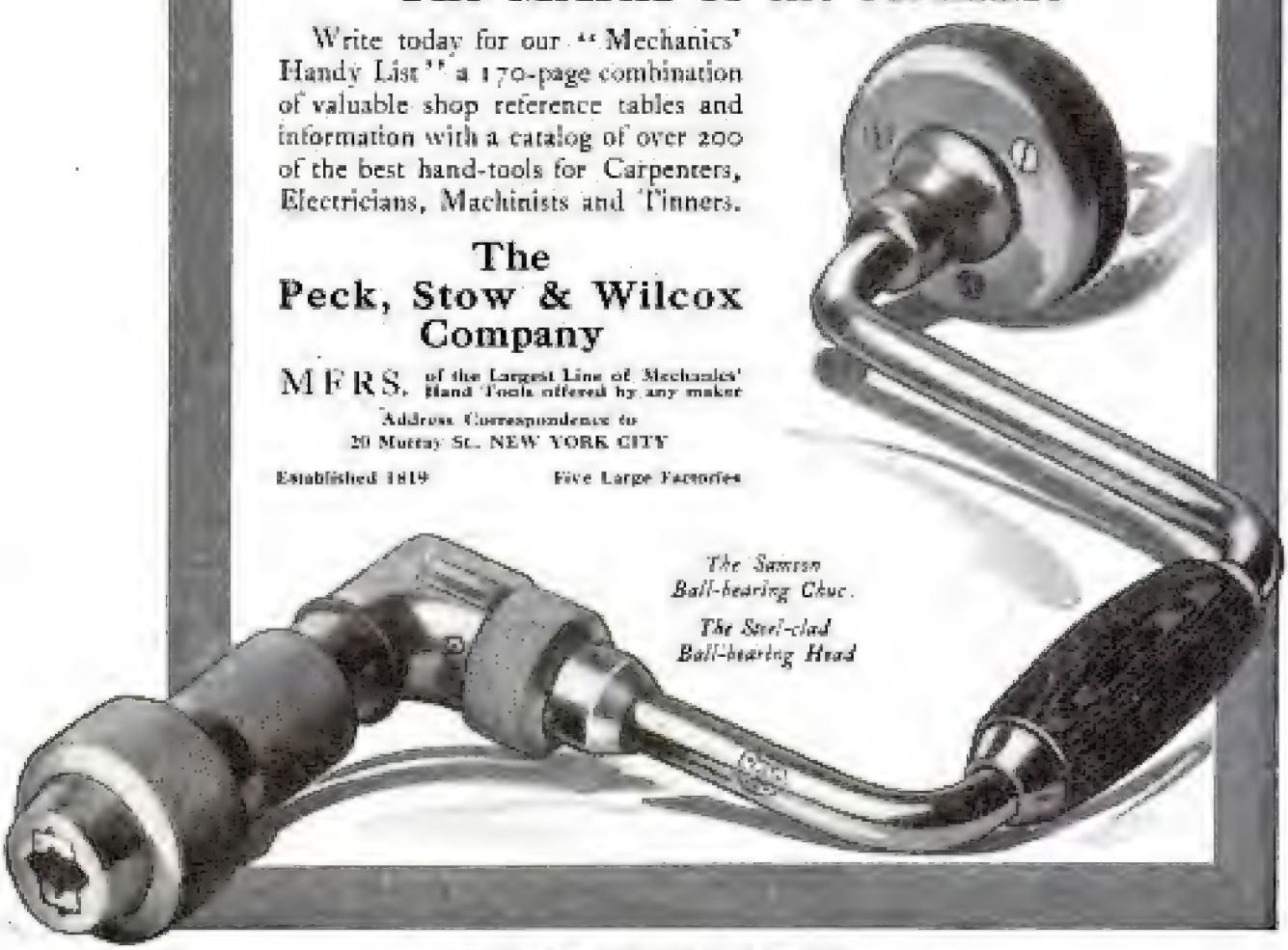
Write today for our "Mechanics' Handy List" a 170-page combination of valuable shop reference tables and information with a catalog of over 200 of the best hand-tools for Carpenters, Electricians, Machinists and Tinners.

The Peck, Stow & Wilcox Company

MFRS. of the Largest Line of Mechanics' Hand Tools offered by any maker

Address Correspondence to
20 Murray St. NEW YORK CITY

Established 1819 Five Large Factories



The Samson Ball-bearing Chuc.

The Steel-clad Ball-bearing Head

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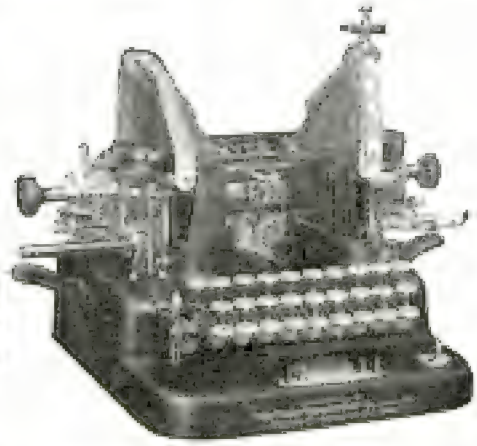

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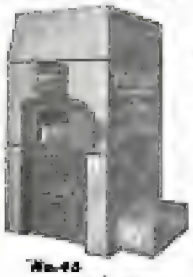

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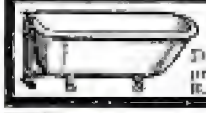

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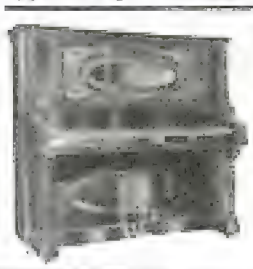

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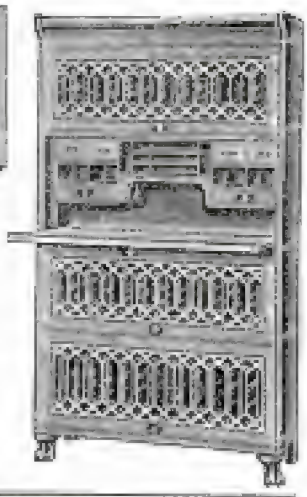

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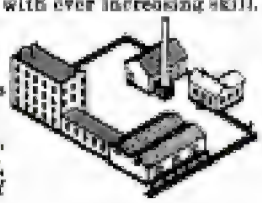

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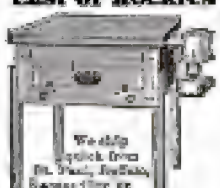

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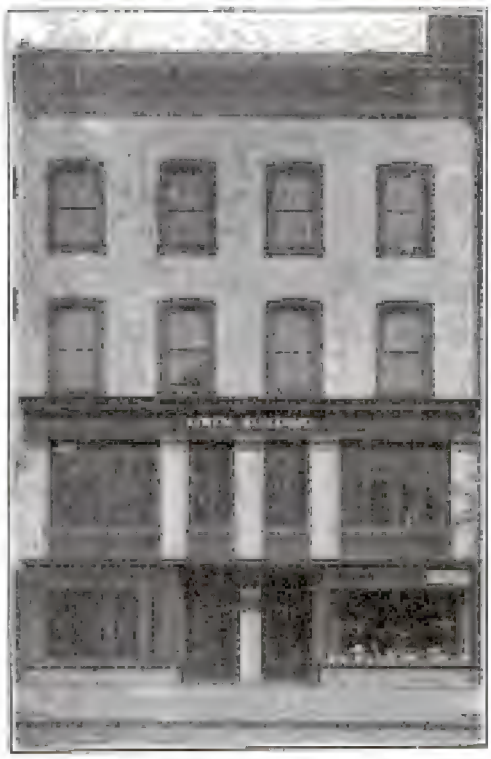

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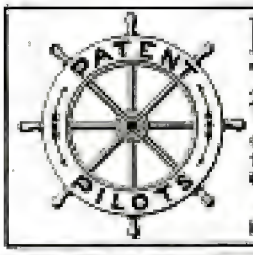

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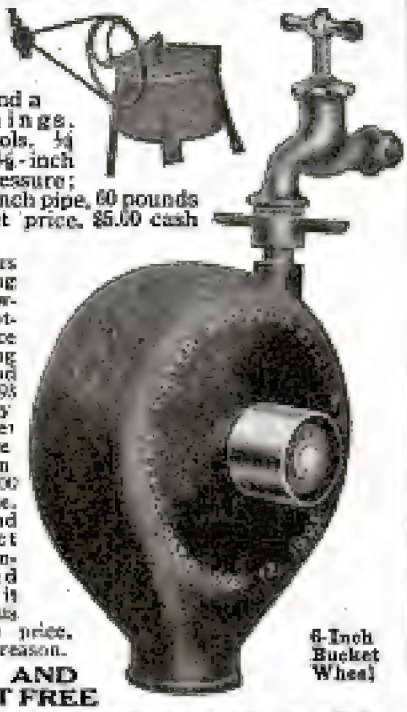

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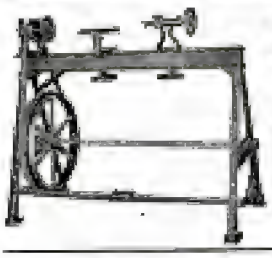

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FOOT POWER for WOOD TURNING

12 inch swing, 51 inches long.

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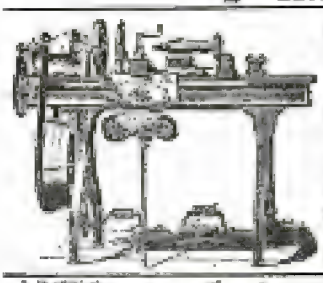

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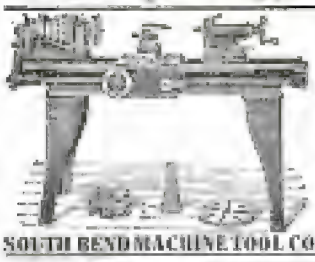

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9 to 13 inch

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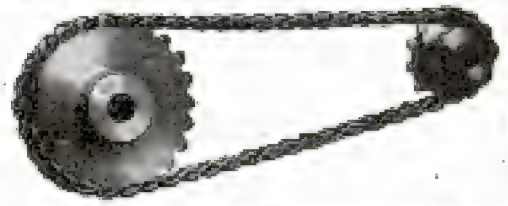

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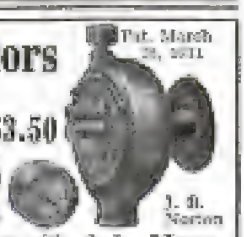
"Norton" Water Motors Lead Them All



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"Norton Improved" with Patented combination shift gear, for flat or round belt $6.50

Very powerful. Catalogue sent upon request

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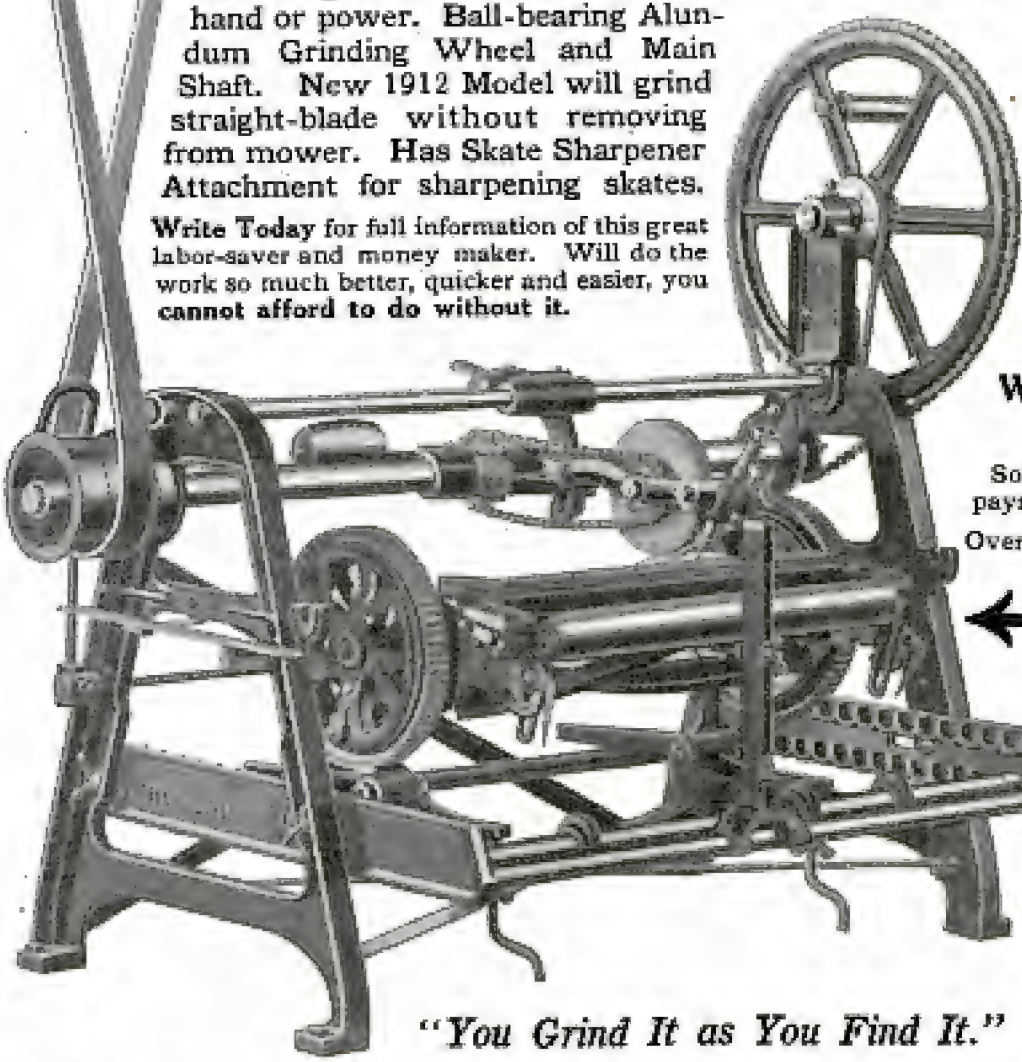

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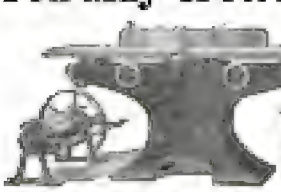
"You Grind It as You Find It."

You May Crowd a Crescent Jointer



to the limit of capacity and the machine will do work just as smoothly as though you had not crowded it at all. Built in six sizes. Send for catalog telling all about them and describing our line of **Band Saws, Saw Tables, Planers, Planers and Matchers, Shapers, Swing Saws, Borers, Disk Grinders, Variety Wood Workers.**

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For Powerful Portable and Stationary Vacuum Cleaning Plants. They take up their own wear. Powerful; Noiseless; can't get out of order.

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Bull-Dog Die Stock

for threading from ¼ to 1¼" pipe.

Cuts from the smallest to the largest threads used on most repair jobs.

The Quick-Opening Die is a Big Feature.

It has a self locking pipe centering device.

Price $8.50

Send for complete list and prices

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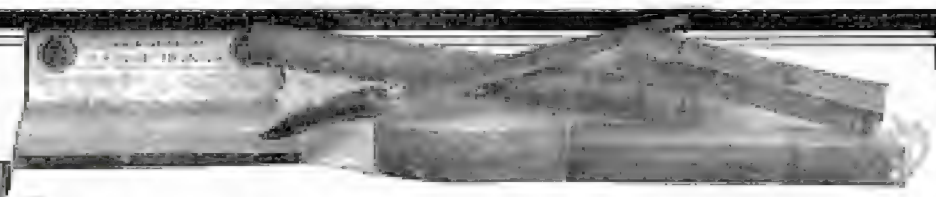

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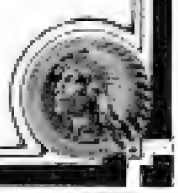

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Make $30 Per Wk.
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Celluloid is a compound of a vegetable fibrine, called cellulose, reduced by acids to gun cotton. This fibrine

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FOR TOOL MAKERS AND MACHINISTS

Twelve styles, felt lined drawers, solid brass trimmings, best of material, beautiful finish, low prices, satisfaction guaranteed. Ask for booklet of cases built for service.

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The Handiest Tool Holder Made

Constructed of hardened steel; accurately machined; and will hold securely, round, flat, square, hexagon, and shaped tools in the tool post, from the largest sized tool down to a No. 60 drill. Write for full particulars, and prices. Satisfaction guaranteed.

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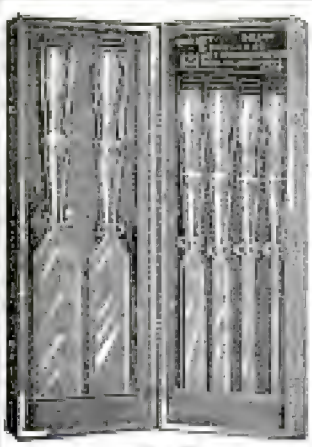

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"OHIO" CHISELS

are made from **high grade and specially selected tool steel,** and the care, skill and experience of our 89 years in the Edge Tool business is put into every tool bearing our "Ohio" Trade Mark shown here. The result is a **high grade and very satisfying tool, with a keen, tough and lasting cutting edge.**

OHIO
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"OHIO" PLANES

are fitted with our special Extra Heavy Cutter, which prevents Chattering or Trembling when used in hard or knotty timber. **High grade cutters, accurate adjustments and true faces** are only a few of the points in which our planes excel and make it well worth your while to insist on having them from your dealer.

Write for our free Catalogue of High Grade Tools and Benches

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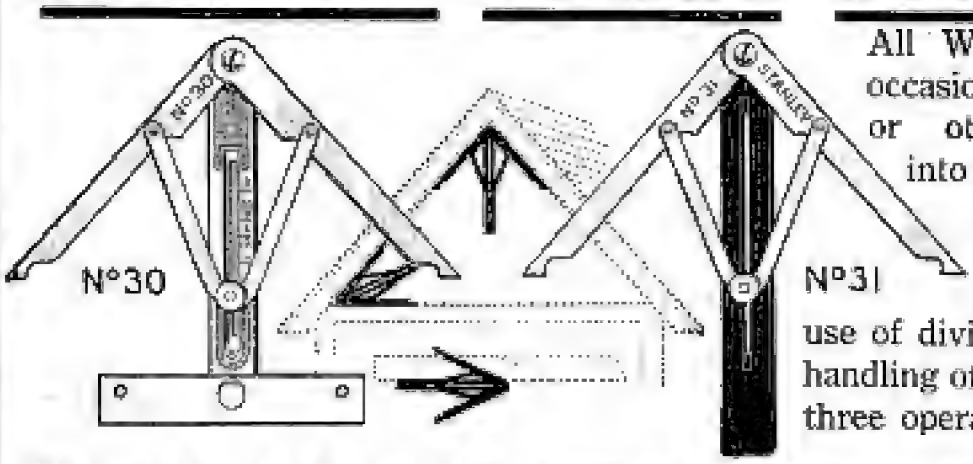

All Wood-workers have occasion to fit mouldings, or other wood work, into odd angles. To lay out the cut with an ordinary bevel necessitates the use of dividers and a second handling of the bevel, making three operations.

The Stanley Angle Divider is designed for performing this work at one setting and is practically a double bevel. The two blades each fit one side of an angle and the handle gives the center line.

No. 30—Is entirely of metal, nickel plated, has graduated handle for laying out 4, 6 or 8-sided work and a "T" head for use as a "T" Square. List Each **$1.50**

No. 31—Has Rosewood handle, is not graduated and has no "T" head. List Each . . **1.00**

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For Sale by All Hardware Dealers

is found in all vegetable life, especially in all young plants. It is a substance like starch. The fiber of cotton is mainly cellulose.

When the cotton fiber is submerged in acids it quickly becomes a thick paste, which is semitransparent. Then camphor is added to further thicken the mass and the desired coloring matter mixed in, which may be of any hue whatsoever. At this stage the celluloid is molded by heat and pressed like wax into various shapes, such as combs, paper cutters, collars, and the like.—Louisville Courier-Journal.

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Standards of efficiency for the Amateur and the Expert. The big improvement in markings, **instantaneous readings,** saves time and avoids error. Send for sample piece of tape and our complete catalogue.

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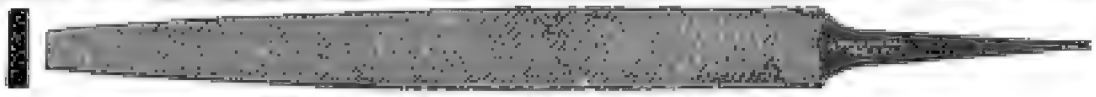
SAGINAW, MICH.
New York London, Eng. Windsor, Can.



Files That Stand the Test

Many an ordinary file becomes useless in a very little while. After being used several times the teeth have lost their sharpness—the cutting edge is gone—the file is worthless. Now the safe way to buy a file is to ask your dealer for

Gold ★ Medal Files and Rasps

Then you are sure of getting the finest file manufactured. Every one is made of a *superior grade of crucible steel,* cut on the latest improved machinery by expert workmen and tempered by our secret chemical process that produces the finest temper known. The result is what every mechanic knows as

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B. & S. Pocket Slide Caliper Rule

For measuring washers or nuts, selecting stock, and taking other external and internal measurements. One side is an ordinary 3" rule; Slide reads to 64ths.

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With a chuck that holds from 0 to 3/8 inches and with only a weight of 21 ounces.

Hand Drill No. 3

is a perfect tool of its kind. Extreme length over all is 11 inches and diameter of drive gear 3 3/8 inches. Has hollow handle to hold Points, which is unique and convenient. For sale by all dealers. Write for catalog and instructive booklet, "*Tool Practice.*"

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Steam Fitters and all Pipe Line Workers

Here is a tool that grips large size iron and steel tubing with the power of a giant—a fast and easy worker on *any* threaded pipe. Seven sizes: No. 10, 11, 12, 13, 13½, 14 and 15. Smaller takes ⅛ in. to ¾ in. pipe—largest, 2 in. to 12 in. This wrench has several distinct advantages. Jaws are interchangeable and so perfectly fitted against shoulder, which is *forged* on handle, that "pull" of the chain is *not* on the jaws or on a bolt, but on the collar forged with the handle. The chain of the

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Chain Pipe Wrench

is hand made and swings from an eye forged in the end of handle, thus making the wrench instantly reversible. Like every other Bonner tool, this wrench is of *highest quality*. Tempering is done by an experi, and jaws can be sharpened only by filing. This is guaranteed as the most efficient and powerful chain pipe wrench made. If your local hardware store cannot supply you, send us dealer's name.

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FOR MENDING HARNESS

shoes, tents, awnings, pulley belts, carpets, saddles, suit cases, buggy tops, dash boards, or any heavy material. Stewart's **Automatic Awl** is the only perfect Sewing Awl.

It takes a wax thread, feeds from spool and does the work of our harness maker machine. It is indispensable for tinkers. Agents wanted. Sent prepaid for $1.75. Send at once for catalog.

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GET THIS!

Time and strength are worth money. With the Double Claw Hammer you save both. It pays for itself many times over. It pulls the nail up instead of rolling it out. You drive the same nail right in again. You never smash your fingers in high nailing, and your left hand is free to hold the board to be nailed. The carpenter who got this up knew his job and saved himself a lot of trouble.

Free delivery to your address on receipt of $1.50

The Double Claw Hammer will pay for itself many times over in the time and strength it saves the user. It is indeed a pleasure to work with it. If you are not satisfied with this hammer send it back at our expense and we will refund your money. Not one returned yet. Remember—It costs three times as much to make this hammer.

SEND FOR IT NOW

DOUBLE CLAW HAMMER CO.
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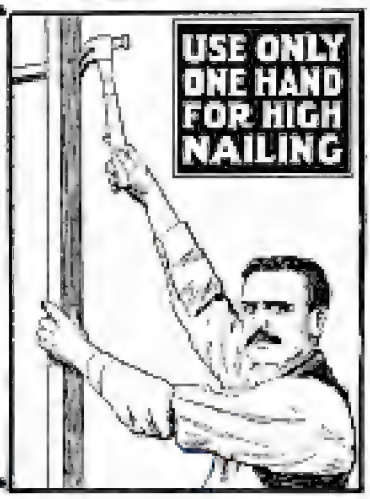

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This "YANKEE" Ratchet Breast Drill

can be worked in places and under conditions where it is impossible to operate any other drill or boring machine. The "YANKEE" improvements enable the user to instantly adapt the tool to the working requirements of any drilling or boring job.

Five Adjustments
Right, Left and Double Ratchet movements; Plain Drill; and gears locked.

Breast Plate can be turned to right angle of position illustrated.

Two Speeds. Changed at a touch of this little lever, at any point in revolution, without removing drill from work.

Two-Jaw Chuck
of new design, for round or square shanks. Jaws are accurate; securely hold drills, bits and other tools—centered absolutely. The hexagon permits use of a wrench for tightening large drills. "YANKEE" Breast and Hand Drills are made also with three-jaw chucks (for round shank tools only).

This Handle is made with a bit for use as a screw-driver for the tool.

AUTOMOBILIST—Ask for "YANKEE" Tools in the Garage.

This Shifter Controls the Adjustments

First notch—Plain Drill; *Second notch*—Left-hand Ratchet; *Third notch*—Right-hand Ratchet; *Fourth notch*—DOUBLE RATCHET; *Fifth notch*—gears locked. Changes made at a finger touch.

The DOUBLE RATCHET is a big time-saver and convenience when work is in close quarters; Every movement of the crank, forward and back, causes the drill to *cut continuously*. Twice the work is done, compared with a single ratchet. The drill is advanced as speedily as with a full revolution of the crank.

"YANKEE" Ratchet Breast Drill No. 555 Length, 17 inches. Weight, 6½ pounds. Double speed. Tongue chuck; capacity, ½ inch. **Price, $5.25.** **Your dealer can supply you.**

Write for "YANKEE" Tool Book" illustrating and describing the various styles of "YANKEE" Ratchet, Breast and Hand Drills and other "YANKEE" Tools

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about than the great silver "daddy dollar" of our own land—vastly more cumbersome, indeed, since they weigh 80 lb. apiece, and are over 2 ft. in diameter. A defaulting cashier would certainly have difficulty in absconding with many of them.

Two of these strange pieces of money form part of a collection of coins in this country. They are circular discs of coralline rock, dull white in color, yet apparently crystalline, 26 in. in diameter, and from 3 to 4 in. thick. At the center of each there is a round hole

Toolmakers and Machinists. Here's a Portable Tool Case with a convenient arrangement of different sized drawers, all felt lined, with a place for every tool. No need of throwing one on top of the other. This Case will pay for itself in saving tools, time and drayage expense. You need one of the many styles shown in our catalogue which we will mail *free*. No mechanic is up-to-date without a "Gerstner" Case.

H. Gerstner & Sons
Mfrs. of Mechanics' High Grade Tool Cases
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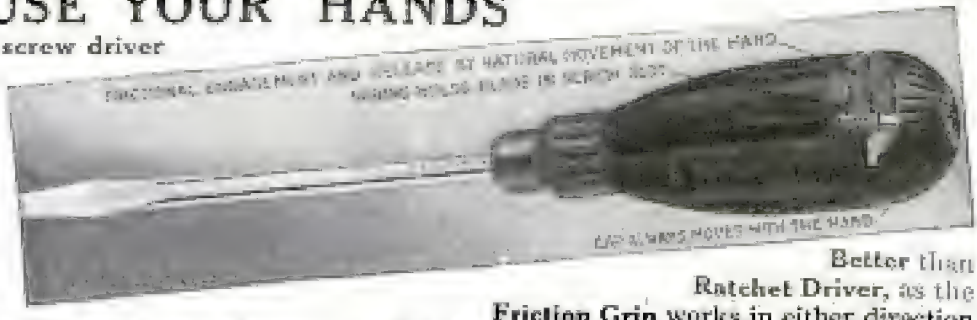
DON'T ABUSE YOUR HANDS

with an old fashioned screw driver

Get a Benjamin Friction Drive Screw Driver with the revolving cap.

No more blisters
Insulated handle



Introductory Prices

Length	3-16 in. Dia.	¼ in. Dia.
3" Blade	.30	.35
4" "	.35	.40
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3-16 in. dia. with straight blade for countersunk work if ordered

Better than Ratchet Driver, as the **Friction Grip** works in either direction **—Without Adjustment.** If your dealer does not carry, write direct to us.

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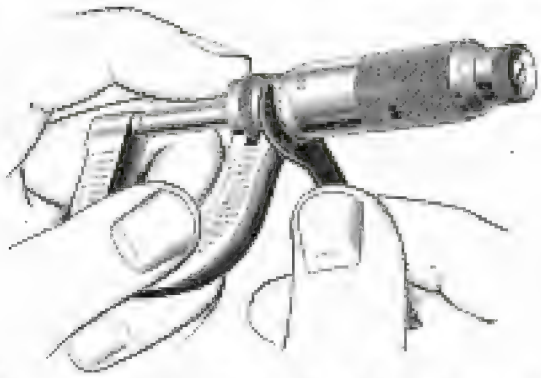


The Simple Adjustment

of the Starrett Micrometers is a feature that enthuses all mechanics. It takes up any wear quickly and accurately — not by the trial, hit-and-miss way of the movable anvil. This is obtained by placing over the barrel a thin, graduated sleeve, which carries the base or zero line, instead of having it marked on the barrel itself.

If at any time on account of excessive wear, the zero line is not correct, a small turn of this sleeve with a small spanner wrench will remedy the error. A wrench is sent with each Micrometer.

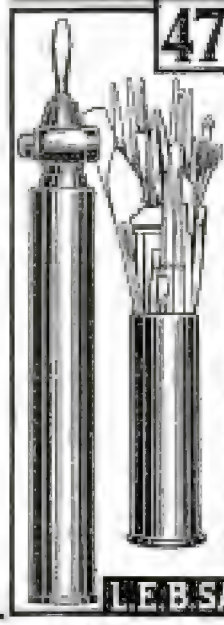
When you see any Starrett Tools you will notice some little difference which makes it better—which makes the Starrett Tools known and trusted wherever accurate work is done.

Catalog 19 AP is free. It tells of and illustrates all the fine Starrett Tools.

The L. S. Starrett Company
Athol, Mass.

POCKET TOOL KIT

47 PERFECT-PRACTICAL SPLENDID TOOLS $1.00



In handsome nickled case, pocket size, for pocket, desk, home, automobile or shop. All of fine steel. A 20th Century marvel.

Some of the 47 Tools

Hammer, Screw Driver, Chisel Corn Knife, Dividers, Tweezers, Compass, Saw, Protractor, File, Round File, Rule, Level, Universal Chuck, Tool Handle, T Square, Tri Square, Scratch Gauge, Depth Gauge, Rule Gauge, Slide Calipers, Reamer, Countersink, Bird Awl, Harness Awl, Scratch Awl, Straight Edge, Ink Eraser, Tack Claw, Nail Set, Center Punch, Big Needle, Sail Needle Button Hook, Spatula, Scraper Stiletto, and ten others.

Made on honor. Sold on guarantee, postpaid. Money back if not satisfied. Remit $1 TO-DAY.

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For the L. E. B. Shock Absorber for Typewriters

Which doubles the life of the typewriter, and accomplishes so much besides that it passes belief. Write us for terms and particulars. Also about our other self selling and fortune making Office Specialties, together with the above L. E. B. Pocket Tool Kit.

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BAR BENDERS

For Concrete Reinforcements

WRITE FOR OUR BENDING TOOL CATALOGUE.

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$1.00 A perfect stitcher. Sews or mends anything. Whole repair shop. Original perfect lock stitch. Diamond point grooved needle protects thread. Always ready. Sample prepaid. Agents get busy. Sells on sight. C. A. MYERS CO., 4339 Lexington Ave., Chicago, Ill., U. S. A.

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quickly through any Earth with our Guaranteed **Well-Boring Outfit.** Nothing else like it. Cheapest and Best method known. Price $10.00 Delivered. *Our Big Circular for 2-cent Stamp. Write to-day.*

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1128-45 Newport Ave. CHICAGO, U.S.A.

2½ in. in diameter.

The Yap chief enjoys a monopoly in this singular sort of coinage. When in want of money he has but to send his slaves to the quarry to fashion as many flat "dollars" as he needs. His treasury is a number of long poles set on supports in front of the royal hut. The dollars are strung on the poles like beads on a necklace.—Harper's Weekly.

An electric flatiron with an automatic cut-off, so that the current is used only when the iron is in operation, has been patented by two Californians.—Los Angeles Times.

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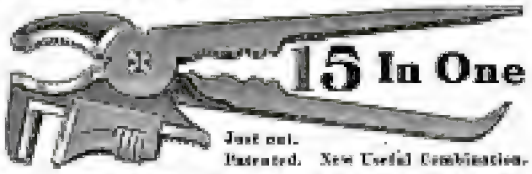

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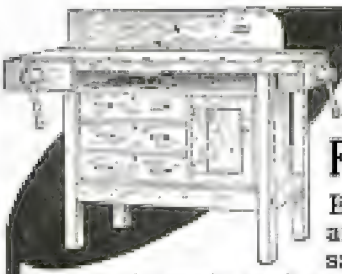

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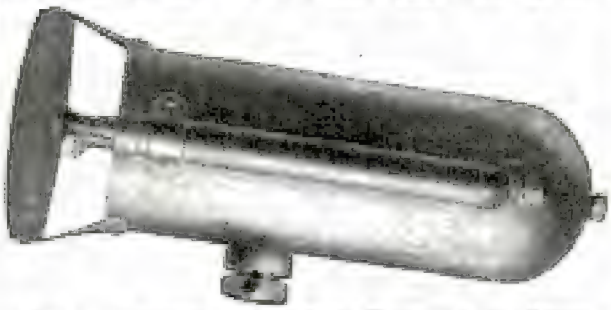

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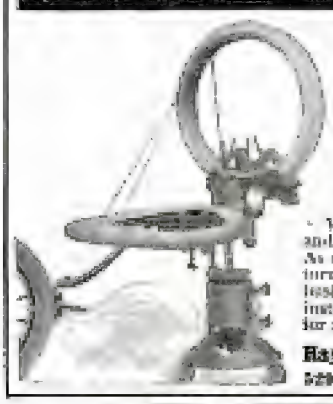

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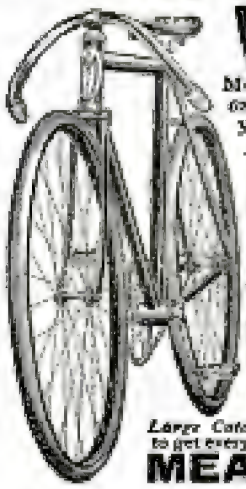

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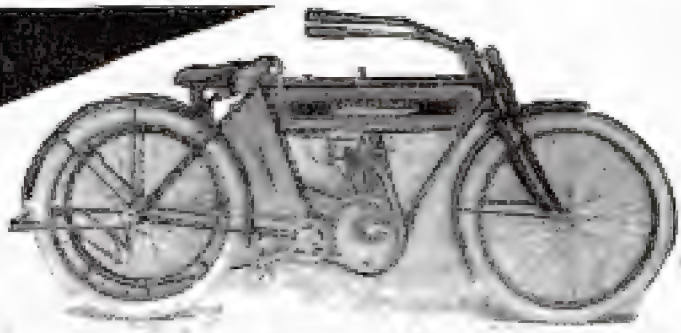

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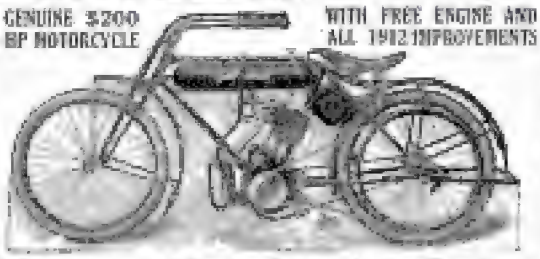

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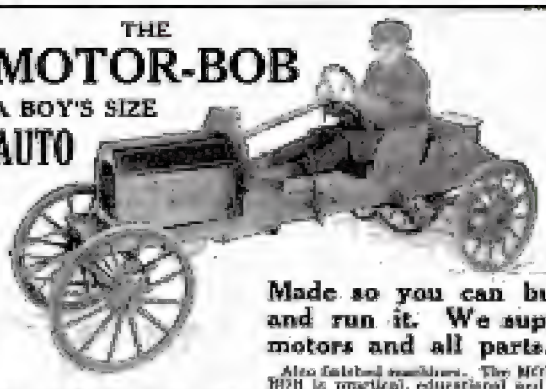

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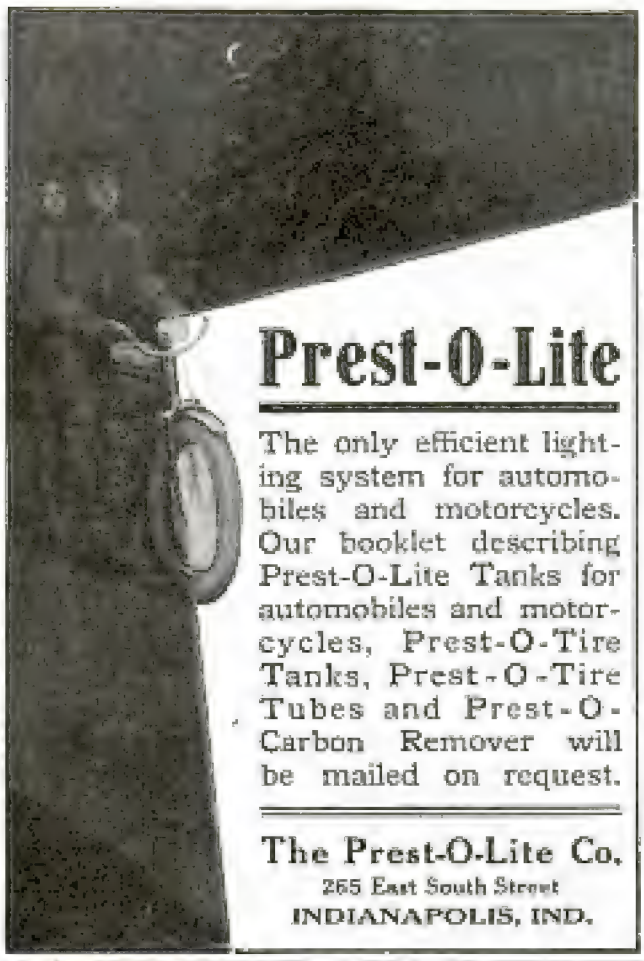

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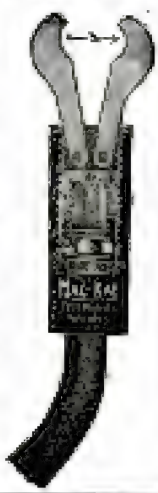

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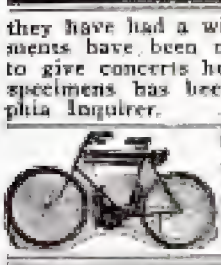

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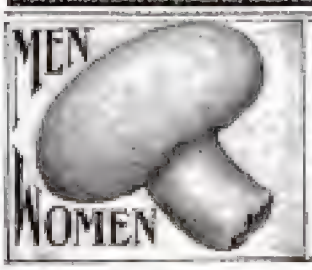

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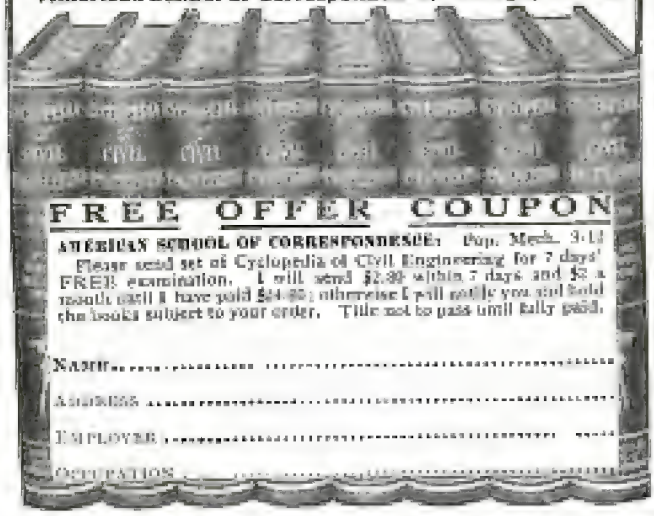

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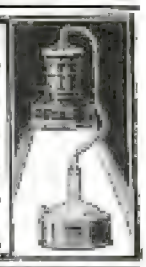

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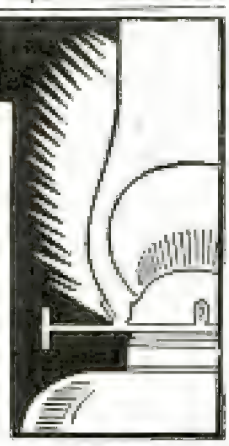

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Now, let's light up!
First puff: ***"Fine!"***
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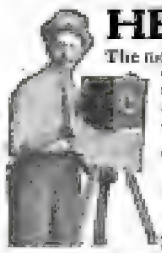

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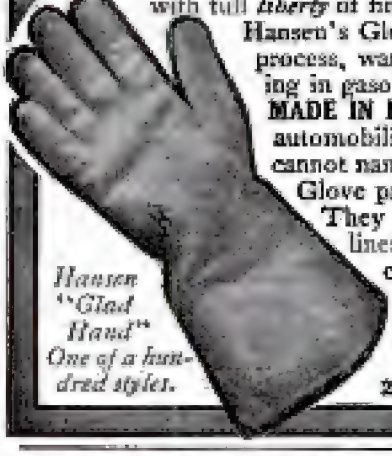

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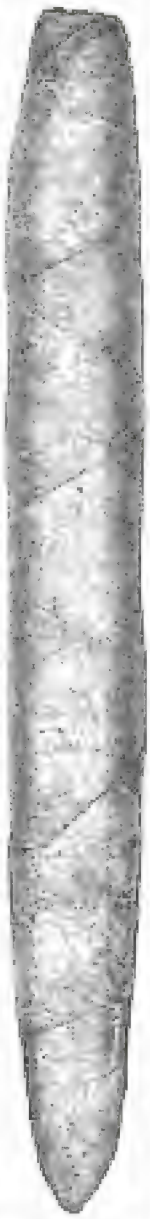

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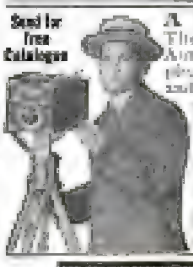

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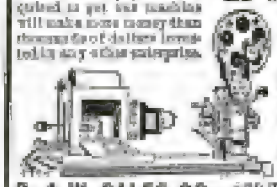

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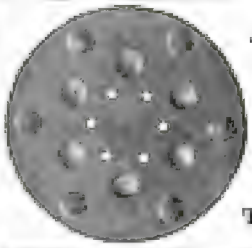

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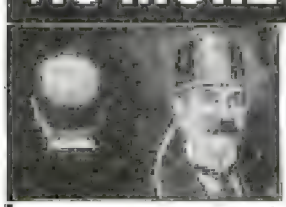

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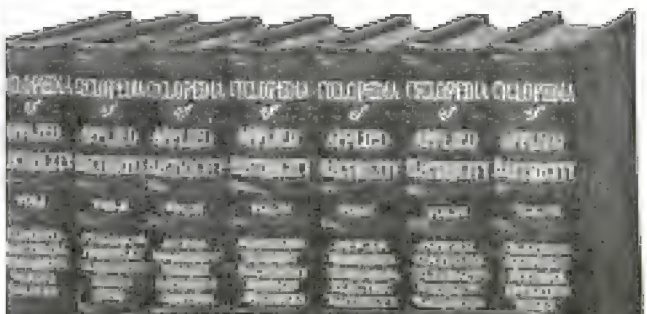

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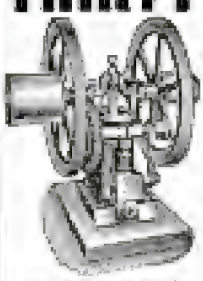

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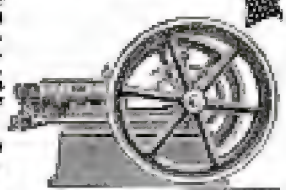

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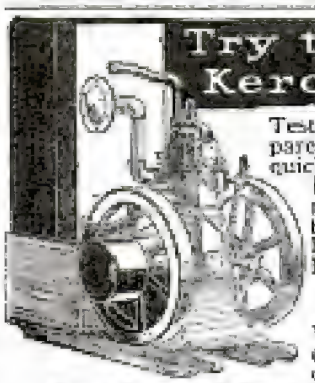

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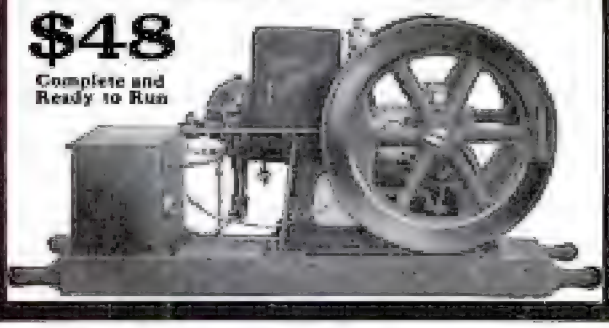

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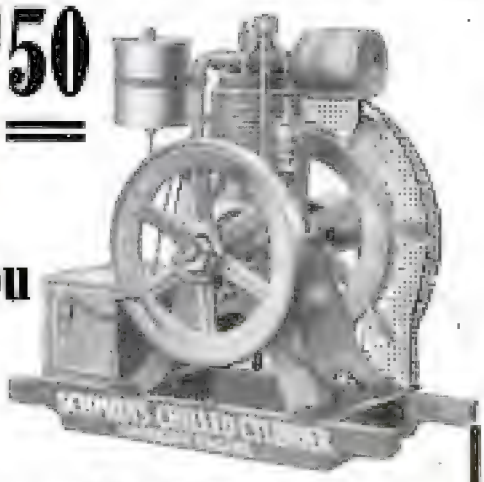

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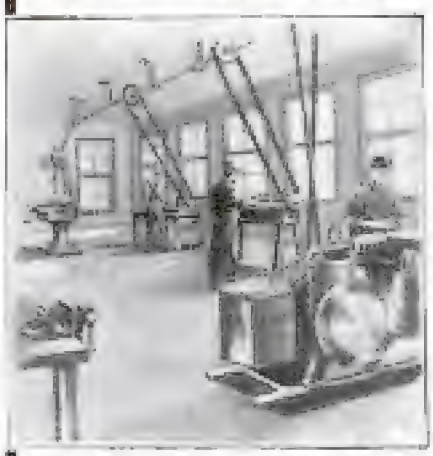

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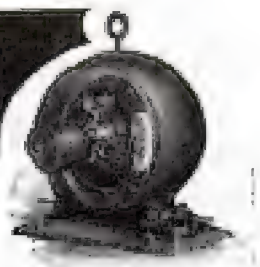

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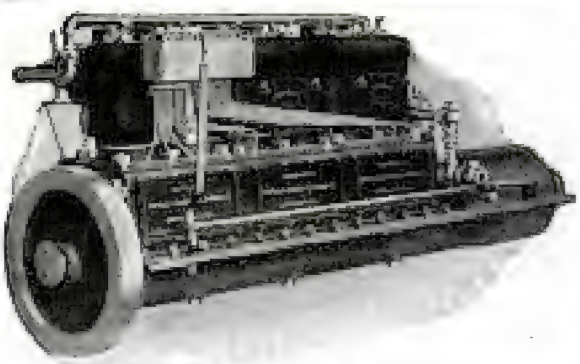

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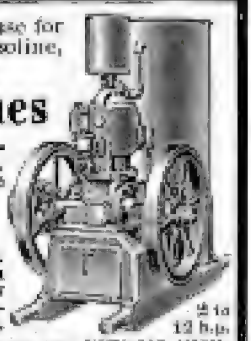

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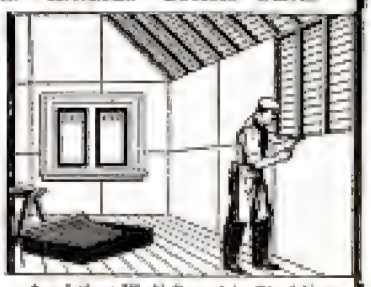

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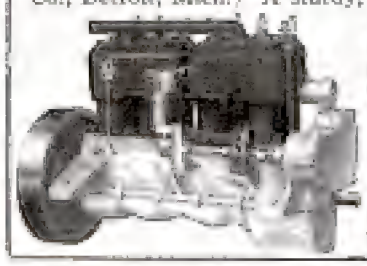

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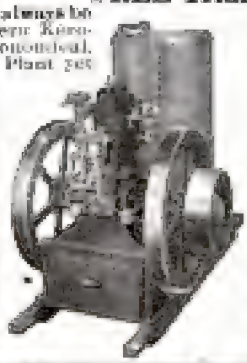

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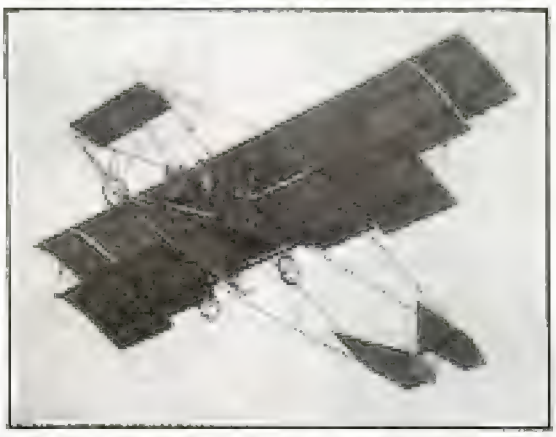

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Two sizes—4 cylinder 50 H.P., 6 cylinder 75 H.P.

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PIRATE II 40 H. P. ROBERTS

The power plant of Pirate II is a ROBERTS 4P-40 H. P. motor which was built in 1908. Four seasons of constant racing service have proven the real worth of ROBERTS quality.

Built in ten sizes. 3 to 125 H. P. 1 to 6 cylinders

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EXPERIMENTS IN SOUND-PROOFING—Professor Nussbaum, a German scientist, has been studying the problem of the suppression of noise in dwelling houses. One point he has ascertained is that the more solid, tough and strong the building material is, the more quickly and loudly it conveys sound. Experiments with partition walls showed that those of tile and cement transmit sound most and those of solid clay least. Between the two comes the wall of ordinary brick, and the more the brick is burned the more noise it trans-

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The fastest and least expensive hull for low powers ever devised. 8 h. p., 14 miles. 30 h. p., 25 miles. Shipped to any part of the world; complete, or taken down and crated, ready to set up and screw together. Export knockdown, **$40.**

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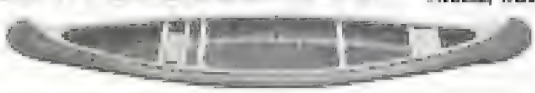

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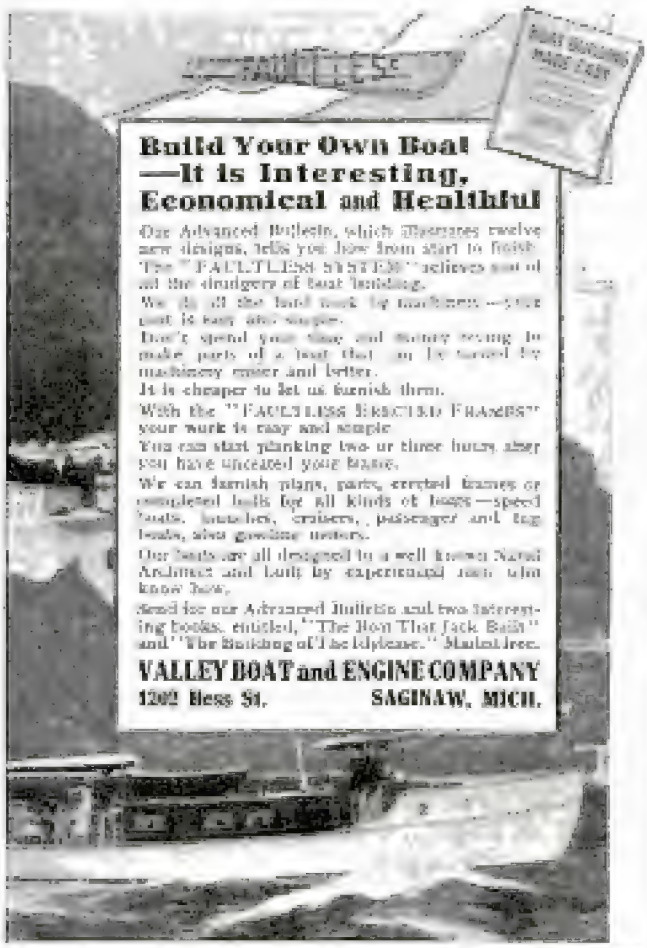

mits. A quickly hardening lime mortar is to be preferred to a clay mortar. It was found that when a floor was covered with sand and cork mats spread over it, hardly any noise penetrated to the room below, but when the cork mats were joined together by any material underneath, noise at once became perceptible below. To exclude the sounds of musical instruments from neighboring apartments, the scientist recommends that the ceilings or walls be lined with a layer of zinc or lead.—The Furniture Journal.

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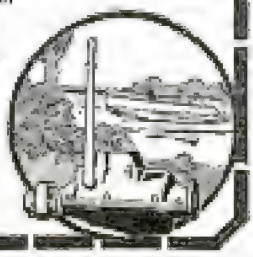

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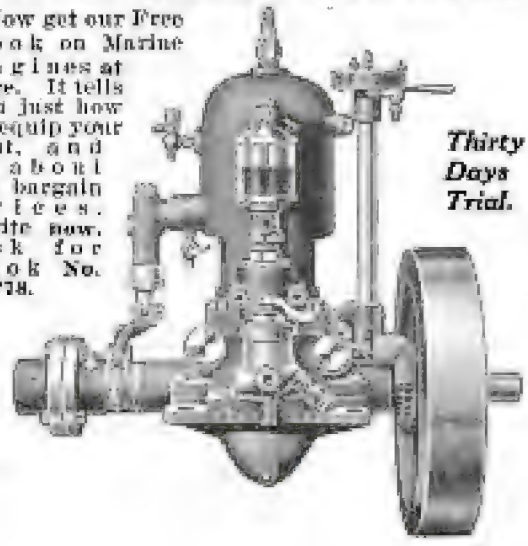

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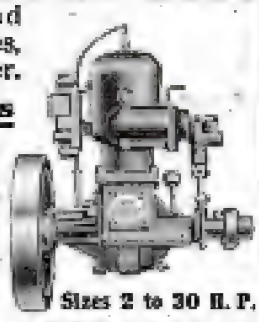

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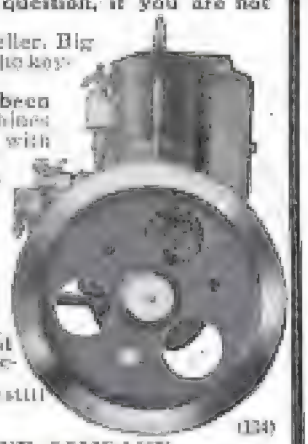

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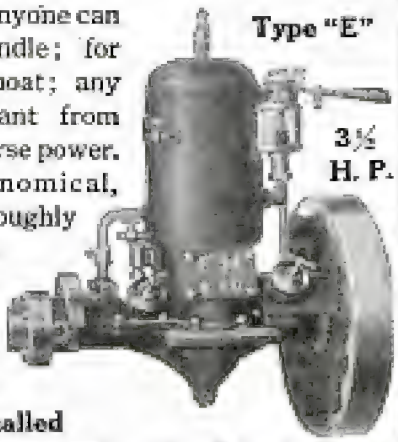

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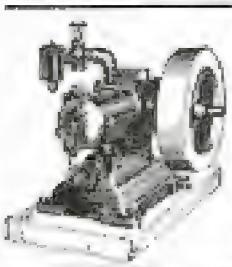
"couvrir," to cover, and "chief" is nothing else but "chef," the head. Kerchiefs were used also for the neck, and that made them neckerchiefs. Finally, when they became what they now are, and were carried in the hand, they expanded into handkerchiefs. Then when pockets were invented and worn, in the time of Queen Elizabeth, the term pocket handkerchief came into use. The word "pocket" is nothing but a form of the old Saxon word "poke," a bag or pouch, combined with the diminutive "et."—New York World.



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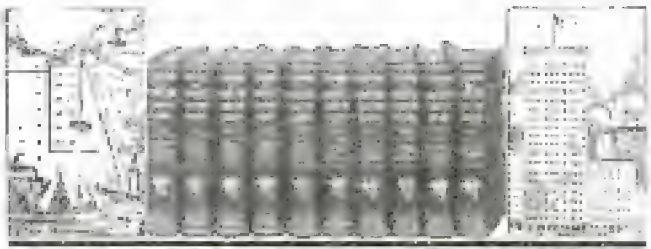

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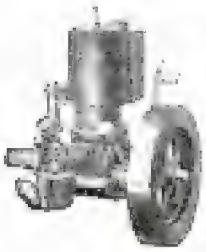

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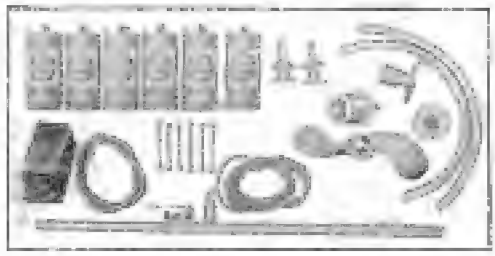

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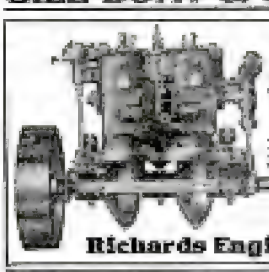

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America's greatest two cycle engine

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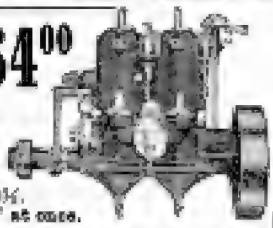

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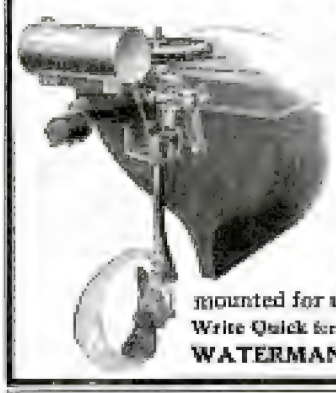

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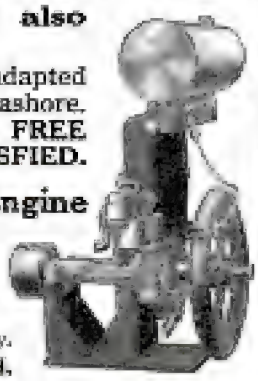

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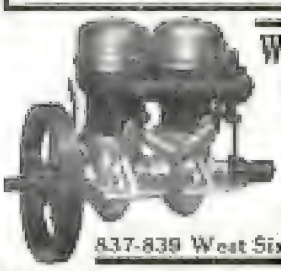
to pry out a stone from the pipe with his poniard. He was immediately beheaded, and the brave soldier who had prevented the theft was made guardian of the pipe, with a pension for life.—New York Press.



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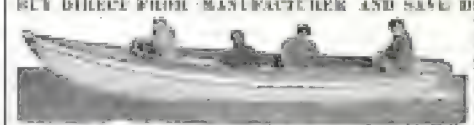

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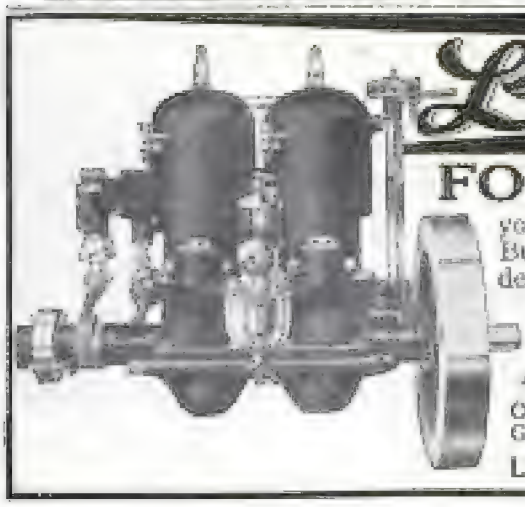

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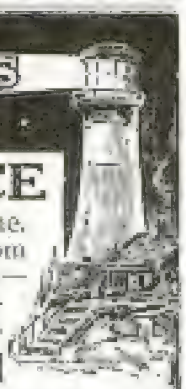

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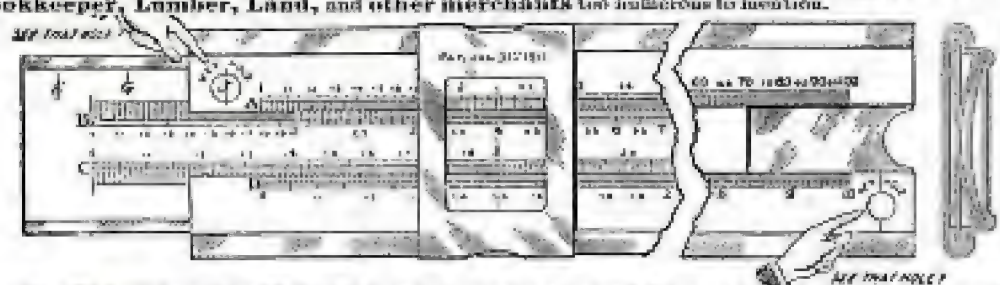

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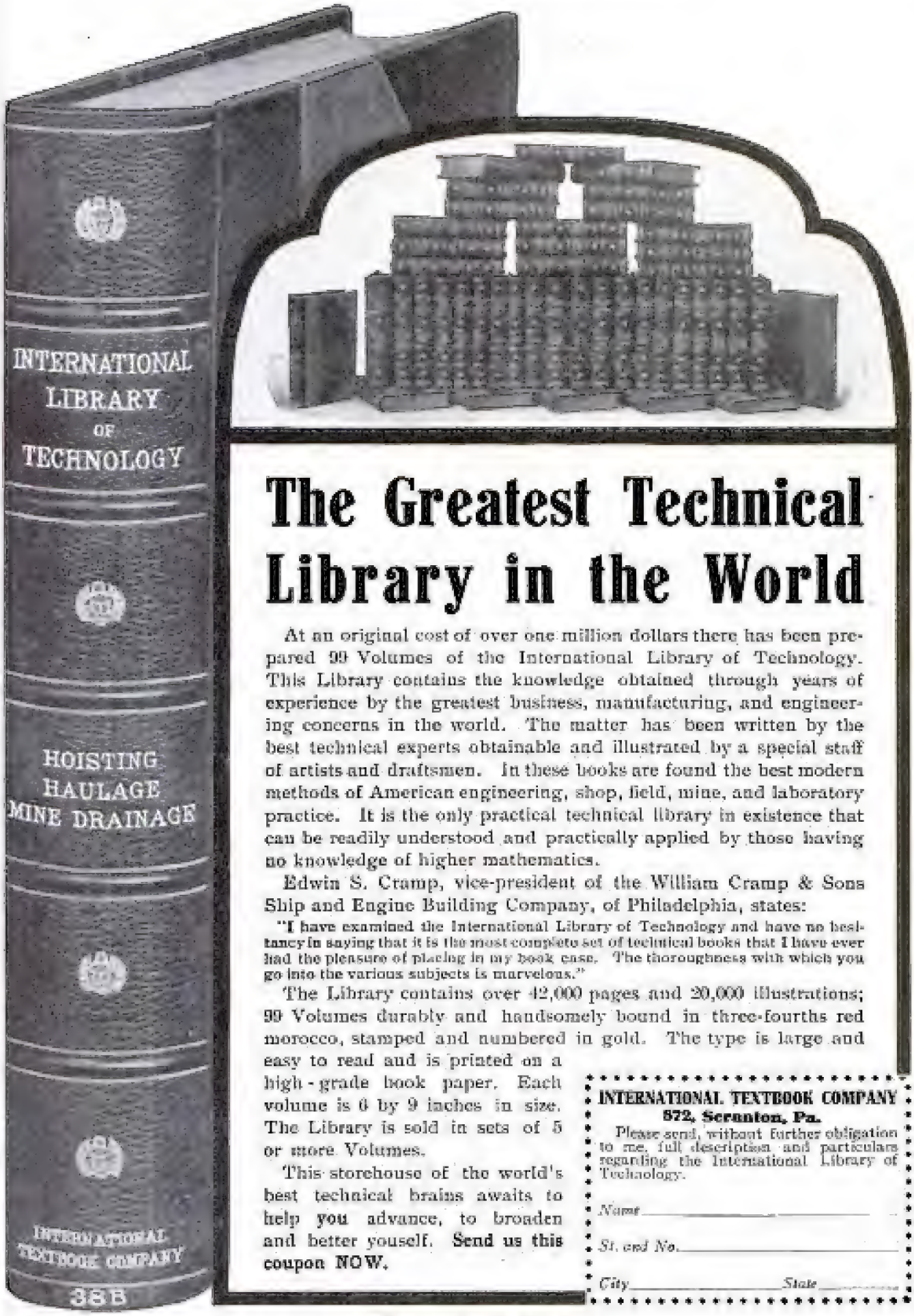

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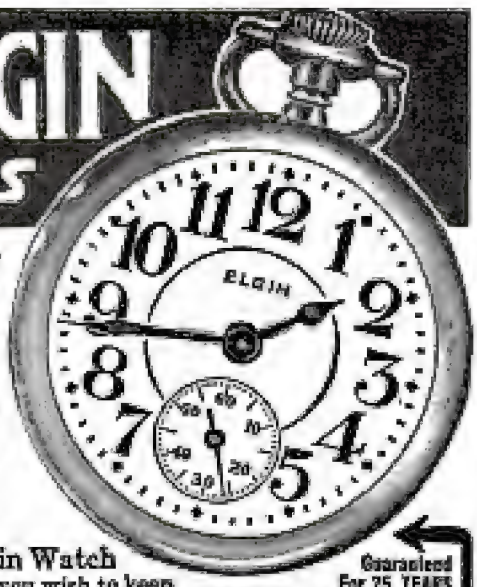

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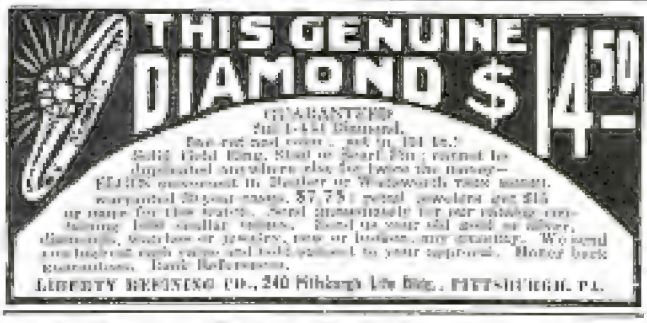

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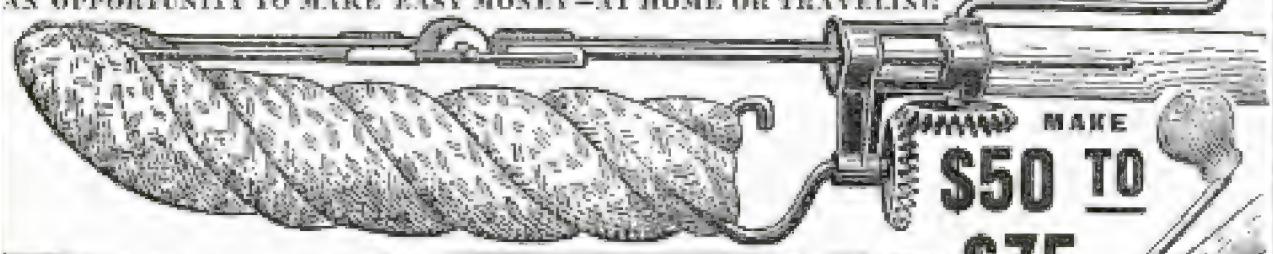

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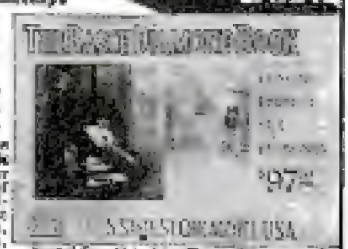

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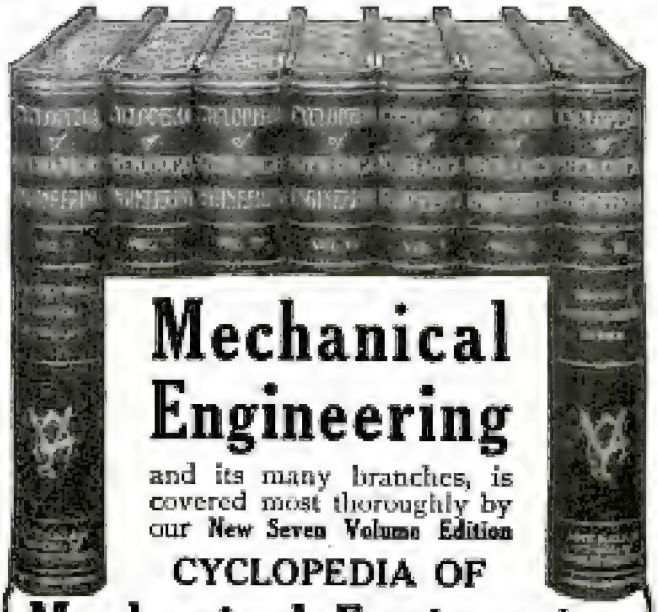

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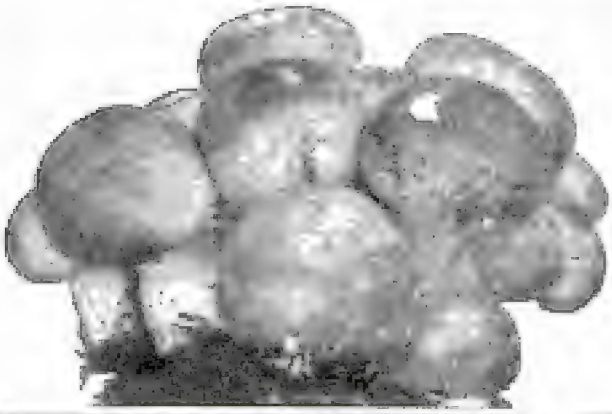

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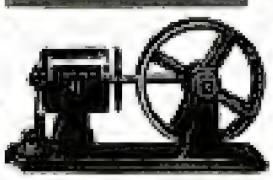

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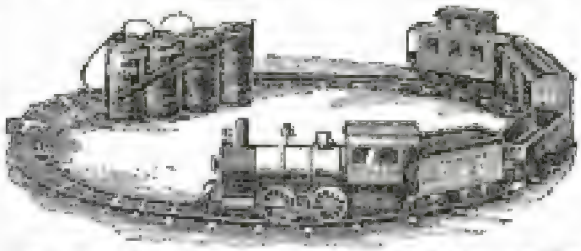

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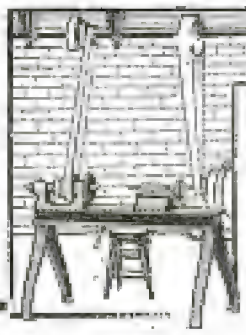

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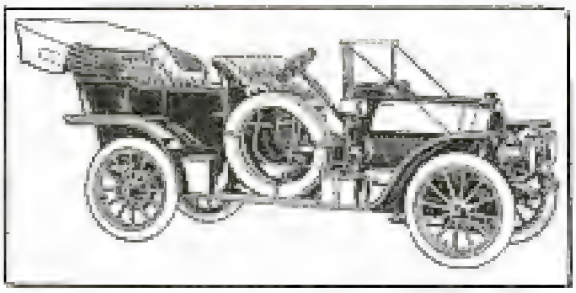

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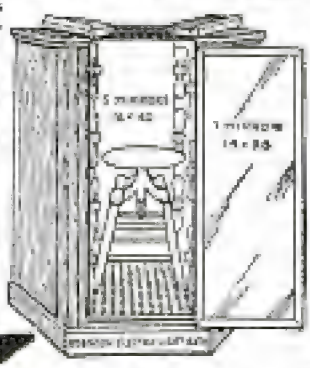

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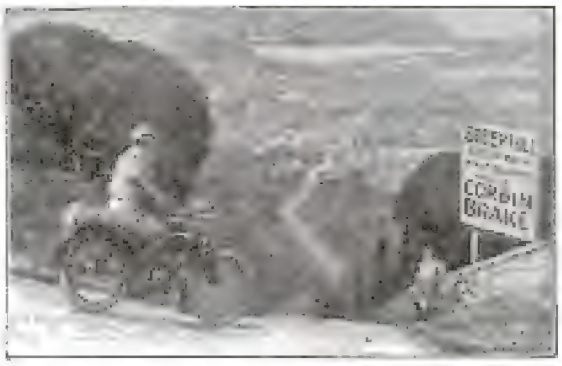

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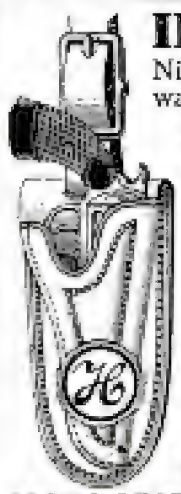

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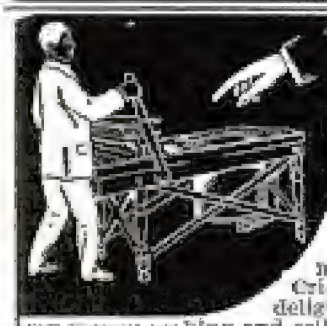

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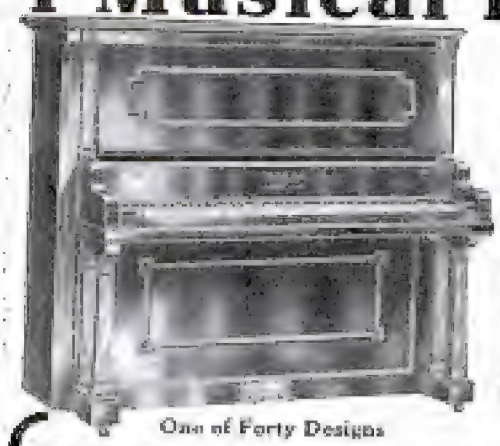

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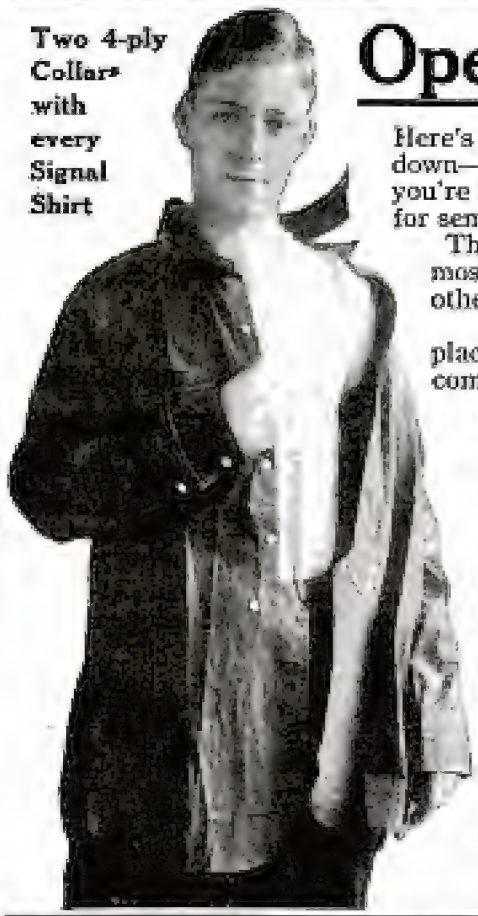

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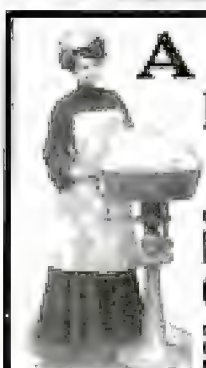

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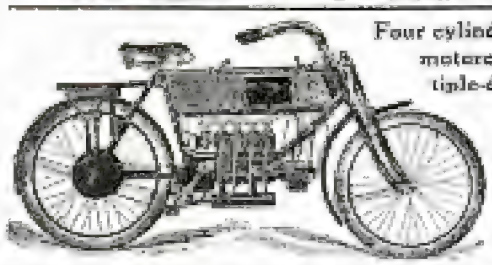

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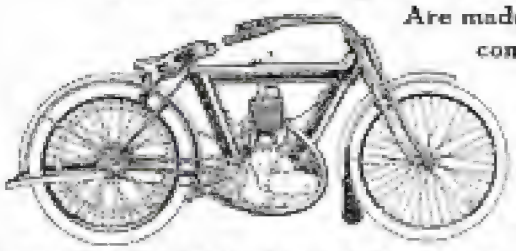

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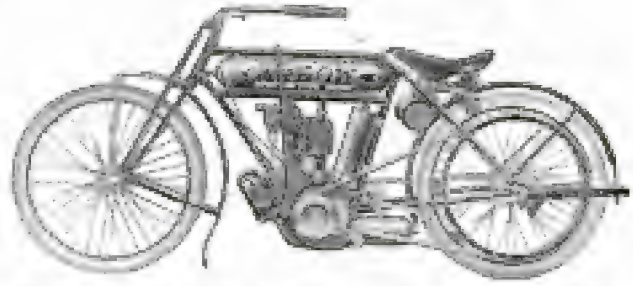

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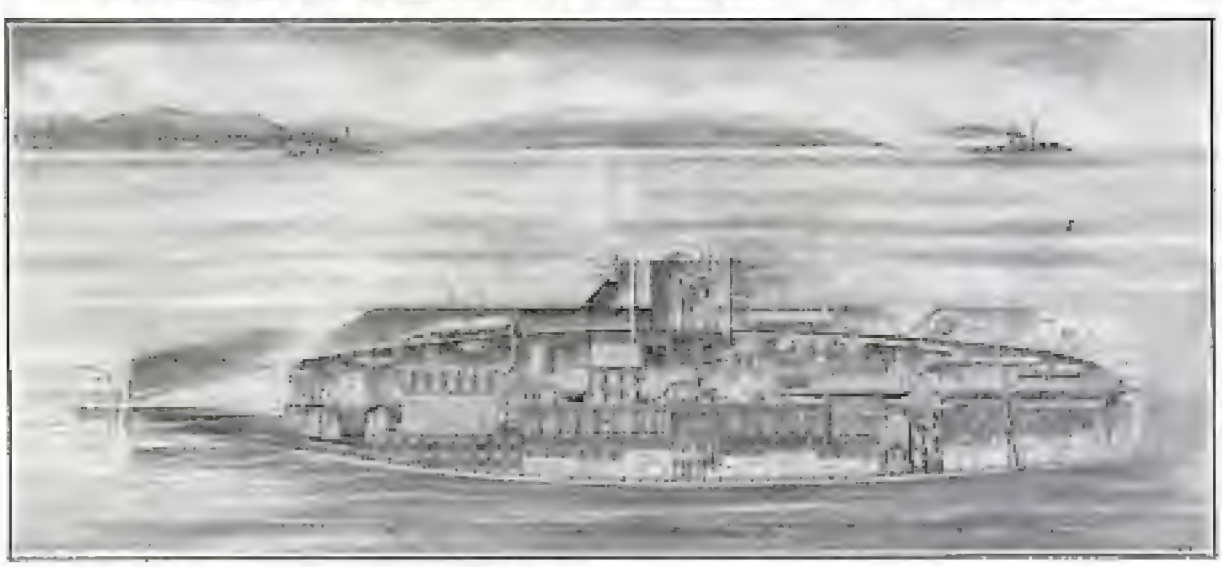

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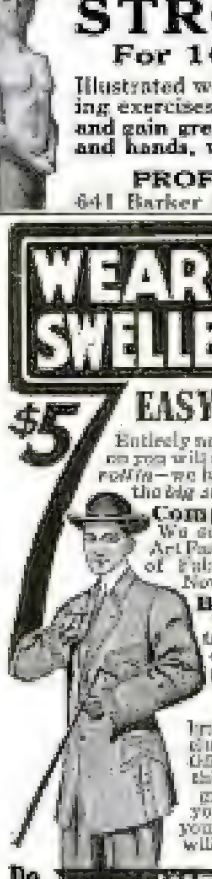

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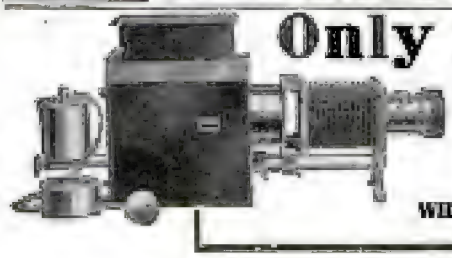

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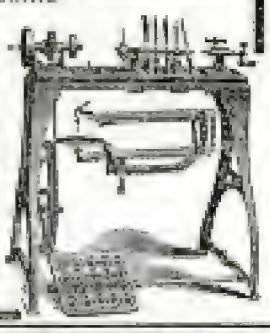

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times become too plentiful for the air to hold, and then we get what is called "precipitation," or rain. But long before the water vapor in the air is heavy enough to fall in rain there is enough of it to spare to make salt damp.—New York Sun.

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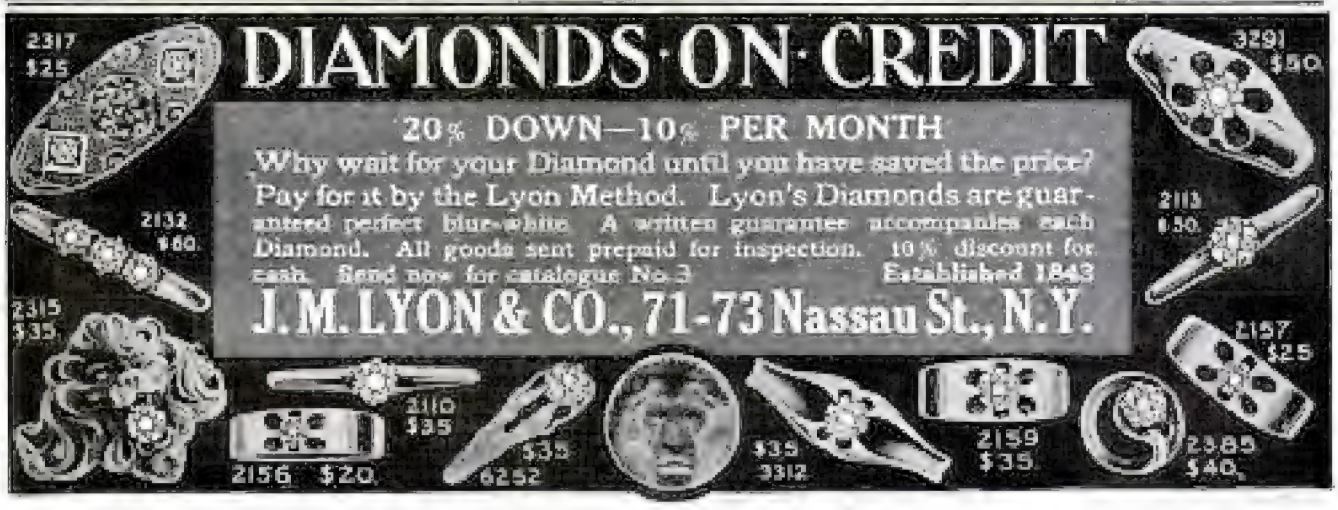

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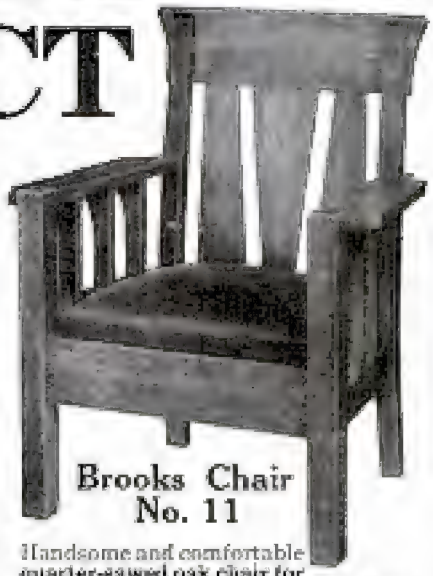
Read How YOU Can Have the Furniture Dealer's 25% to 75% Profit on Superb Quartered Oak Furniture

Notice the prices and descriptions on this page —then write for the Brooks Furniture Book, the Brooks Plan, Brooks prices.

Buy from the furniture factory direct. Leave the dealer out. You can have his profits — 25% to 75% and higher. You'll pay ½ and less than ½ dealers' prices and secure the very finest Arts and Crafts furniture human skill can produce.

The Brooks Direct Sale Plan from furniture factory to consumer has fitted thousands of homes, lodges, fraternity and clubhouses, barracks and state institutions. It has proved its worth under the careless handling and abuse of college students and soldiers. With ordinary household use Brooks furniture will last a lifetime.

Built by skilled cabinet workers of choicest quarter-sawed oak. Fitted and finished with the utmost care, and shipped in sections. Anybody can set up a chair, davenport or table in just a few minutes.



Brooks Chair No. 11

Handsome and comfortable quarter-sawed oak chair for living room or den. Possesses all the dignity of the Arts and Crafts style relieved by curved and diagonal lines under the arms and in the back. Height, 37½ inches. Width, 31 inches. Depth, 21 inches. Price includes cushion covered with marokene leather.

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Write for 64-Page Furniture Book

Filled from cover to cover with beautiful photographic reproductions of all kinds of furniture showing the very grain of the wood, and giving you a true idea of the beauty of these Brooks masterpieces. Write today for this book—mailed Free—also full particulars of the Brooks sales method that cuts the dealer's price in half. Address

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Brooks Breakfast Table No. 312

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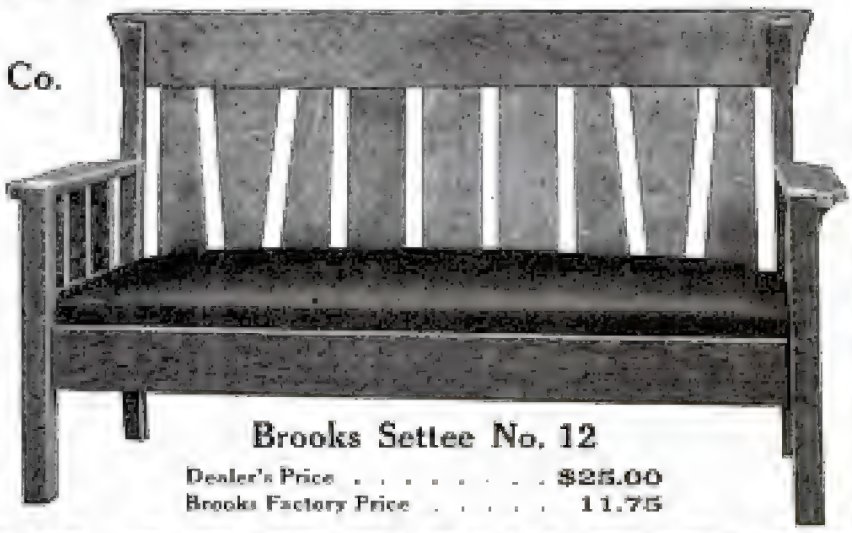

Brooks Settee No. 12

Dealer's Price $25.00
Brooks Factory Price 11.75

This roomy settee is one piece of the set to which the No. 11 chair shown on this page belongs. However its admirable design is one that seems to fit into its surroundings no matter what their style. Height, 37½ inches. Length, 67 inches. Depth, 21 inches. Material, quarter-sawed oak. Price includes cushion covered with marokene leather.

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THE WAY TO OIL A CLOCK—When a clock does not run continuously, or stops frequently, the cause is often due to a lack of oil. This may be remedied by saturating a piece of absorbent cotton with kerosene oil and placing it inside the clock below the pendulum. When the cotton is removed a month or so later it is found to be very dirty. This shows that the fumes of the kerosene oil have not only oiled the clock, but have also cleaned it.—Pictorial Review.

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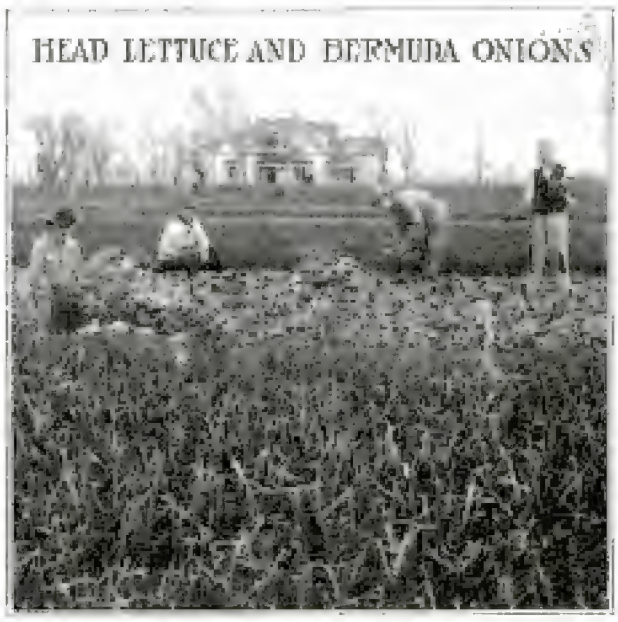
Hoarding Up Happiness

By FRANKLIN O. KING

The Miser Hoards for Greed of Gain—The Wise Man Saves 'gainst Days of Rain. The World hates a Miser, but loves a Provider. By *Cancelling* a few Habits, You will be able to *Divide* more Comforts with Your Family, and Happiness will *Multiply* for All of You. Happiness after all is a mere question of *Arithmetic*. "For unto Every One that Hath shall be Given, and He shall have Abundance; but from Him that Hath Not, shall be Taken Away even that which he Hath." The Man who Lays by Something each day for his Loved Ones is *Hoarding up Happiness*, because he is providing for them an Independent Future. "You may sin at Times, but the Worst of All Crimes is to Find Yourself Short of a Dollar or Two."

How much Better off are You than Last Year, or the Year before That? How Much have You Actually Got that You could call Your Own? A little Furniture? A Piano, perhaps? A Few Dollars in the Bank? And how many Weary Years has it taken You to get Together that little Mite? Don't You see how Hopeless It is? You come Home each Night a little more Tired, and Your good Wife can see the gray coming into Your Hair—if It isn't already There. Chances for Promotion grow Less and Less, as each Year is added, but Ever and Always Your Expenses seem to Grow.



A Winter Vegetable Garden near Danbury.

The Systematic Saver Accumulates slowly, unless His Savings are Put to Work where They can Earn Something Worth While. Fifteen Hundred Dollars put into the Savings Bank will, in One Year, at 3 per cent earn You less than Fifty Dollars. Half of Fifteen Hundred Dollars invested in One of our Ten-Acre Danbury Colony Farms, in convenient Monthly Payments (Protected by Sickness and Insurance Clauses) will Earn Freedom from Care, and that Comfort which comes from the Ability to Sit under One's "Own Vine and Fig Tree," with a certain Income Insured.

The Best Incentive to Persistent and Systematic Saving is the Desire to Get a Home. The Best Place I Know of to Get a Home is in the Rain Belt of Gulf Coast Texas, where You can Grow Three Big Money-Making Crops a Year, on the Same Soil, and where Irrigation and Fertilization do not Eat up the Profits Your Hands Create.

If every Man who reads this Article would Take the Time to THINK, and the Trouble to INVESTIGATE, every Acre of our Danbury Colony Land Would be Sold Within the Next Three Months. If Every Woman who glances through this Advertisement but Knew the Plain Truth about our Part of Texas, You couldn't Keep Her away from There with a Shot-Gun, because the Woman is Primarily a Home-Seeker and a Home-Maker, and the Future of Her Children is the Great Proposition that is Uppermost in Her Mind and Heart.

Do You Know that Growers of Figs, Strawberries and Early Vegetables clear a Net Profit of $300 to $500 an Acre in Gulf Coast Texas? Do You Know men have realized more than $1,000 an acre Growing Oranges in Our Country? If You Do Not know these things, you should read up on the subject, and you must not fail to get our Free Book, which contains nearly 100 photographs of growing Crops, etc.

What would You think of a little Town of about 1,200 People situated near our Lands, where they ship on an average of $400,000 worth of Fruit, Vegetables, Poultry, Eggs, etc., a year? During 1910 this Community shipped nearly $100,000 worth of Strawberries alone.

We are situated within convenient shipping distance of Three Good Railroads, and in addition to this have the inestimable Advantages of Water Transportation through the Splendid Harbors of Galveston and Velasco, so that our Freight Rates are Cut Practically in Half. The Climate is Extremely Healthful and Superior to that of California or Florida—Winter and Summer—owing to the Constant Gulf Breeze.

Our Contract Embodies Life and Accident Insurance, and should You die, or become totally disabled, Your Family, or anyone else You name, will get the Farm without the Payment of another Penny. If You should be Dissatisfied, we will Absolutely Refund Your Money, as per the Terms of our Guarantee.

Write for our Free Book. Fill Out the Blank Space below with Your Name and Address, plainly written, and mail it to the Texas-Gulf Realty Company, 1316 Peoples Gas Building, Chicago, Illinois. Read It carefully, then use Your Own Good Judgment.

* * *

Please send me your book, "Independence With Ten Acres."

March issue Popular Mechanics

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"I shall simply leave them alone. It will not be necessary to spend a cent on them." They are covered with

Amatite ROOFING

AMATITE has a real mineral surface and therefore needs no painting.

There have been other ready roofings in the past which had a mineral surface, but they were not practical.

Amatite, however, is successful because the mineral matter is embedded in *pitch*. Pitch is very tough and has great adhesive power. Year after year those roofs will give faultless service without anybody giving a thought to them. This is the kind of roofing to have! The day of these smooth coated roofings that require a heavy coat of paint every year or two is past. They cost too much to maintain.

You can spend more money on the paint alone during the ten years than a new Amatite roof would cost.

A free sample of Amatite Roofing and a booklet can be obtained on request by addressing the nearest office.

Everjet Elastic Paint

A very low-priced black paint—very tough and durable. Stands heat so well that it can be used on boilers. For wood or metal, ready roofings, fences, iron work, farm implements, tanks, etc.

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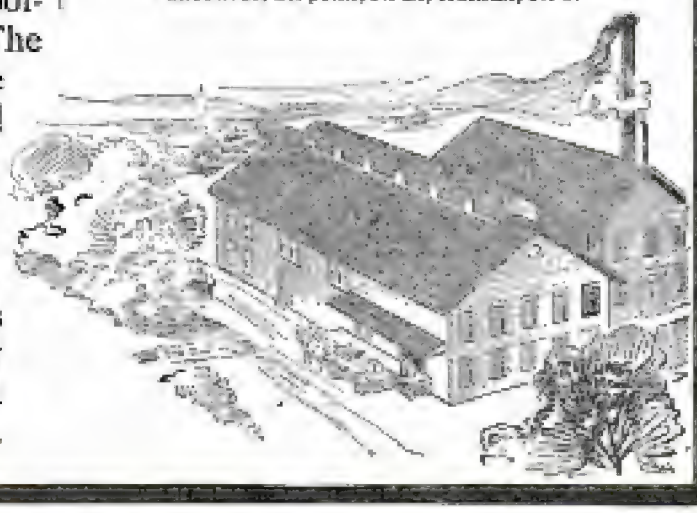

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Get a suit made of our PURITAN SERGE

'Twill be a suit you'll hate to part with, even after it has served its time.

Ready-to-wear or custom-made—the choice is up to you. But if you'd be **sure** of its looks and its wear—specify PURITAN SERGE **in any case.**

Resists wrinkles—"comes back" after every pressing—does you credit every time you put it on.

Reg. Name Stamped on the Cloth

PURITAN SERGE 1620

A Thoroughbred Serge
For the Man who Cares

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